1-F-40

MAINTENANCE MANUAL

A605

CE-23A
SPECTRUM DISPLAY

CUSHMAN
ELECTRONICS, INC.

CE-23A
SPECTRUM DISPLAY

MAINTENANCE MANUAL

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5601-0047

April 1974

CUSHMAN ELECTRONICS, INC.

MANUAL CHANGE NOTICE

INSTRUMENT CE-23A MANUAL NO. 5601-0047 DATE PRINTED April 1974

The following changes are necessary to bring your manual up to date. Changes are listed with the instrument serial numbers to which they apply. It is suggested that you enter these changes in your manual immediately.

Serial number 247 and up.

Parts list, Sweep Generator/Hi-Level Alarm, 2300, p. 3-21, 3-22, change data as follows:

C1,C2, C3	Cer, 1000 pF, ±10%, 1000V	1005-0062	Erie	801-000-X5F0-102K
R2	Comp, 560K, ±5%, 1/4W	1066-5645	A-B	CB5645
R20	Comp, 9.1K, ±5%, 1/4W	1066-9125	A-B	CB9125
R26	MF, 5.62K, ±1%, 1/8W	1075-0013	Dale	MFF 1/8

Schematic Diagram, Figure 3-5, Sweep Generator/Hi-Level Alarm, 2300, p. 3-25, change the values of the following: C1, C2, C3, to read 1000pF, R2 to read 560K, R20 to read 9.1K, R26 to read 5.62K 1%.

Schematic Diagram, Figure 3-6, Marker and Variable Oscillator, sheet 1, 2400, Component Identification drawing. Change location of C23 + sign from present position to a position next to C24.

5614-0039

Date Nov. 1976

CUSHMAN ELECTRONICS, INC.

MANUAL CHANGE NOTICE

INSTRUMENT CE-23A MANUAL NO. 5601-0047 DATE PRINTED APRIL 1974

The following changes are necessary to bring your manual up to date. Changes are listed with the instrument serial numbers to which they apply. It is suggested that you enter these changes in your manual immediately.

Serial number 191-up.

Logarithmic Amplifier. 2100, parts list, p. 3-10, change stock number of L9 to 1596-0087.

All serial numbers.

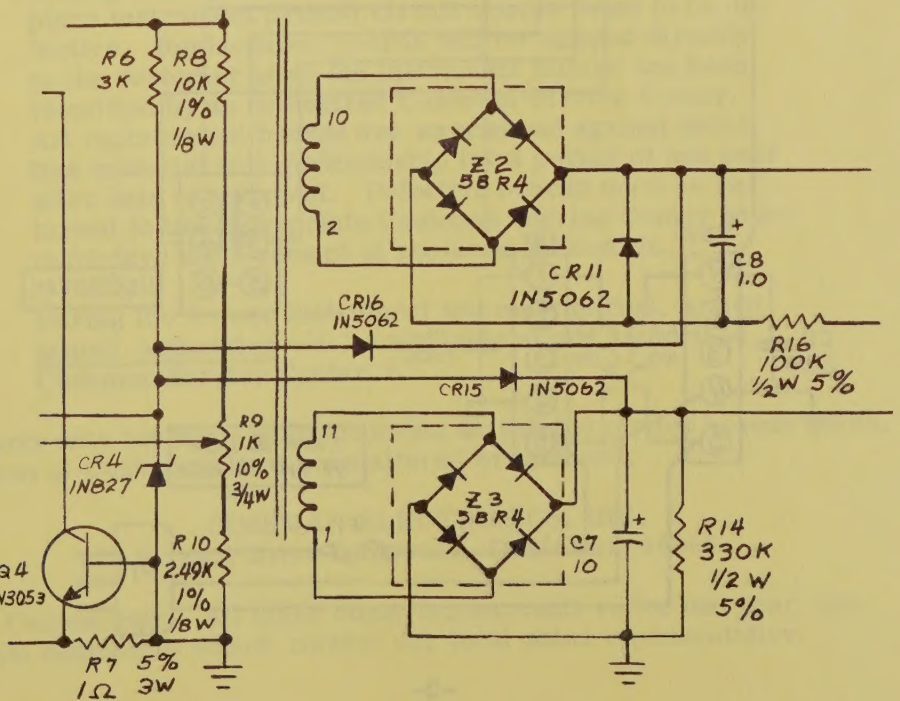
Figure 3-3. Logarithmic Amplifier. 2100, p. 3-13. Reverse the polarity indication on C28. The plus (+) lead should be connected to R32.

Serial number 191-up

High Voltage Power Supply. 3100, parts list, p. 3-61, add two diodes and change R7 as follows:

CR15 CR16	Si, 1N5062	1281-0030	G. E.	1N5602
R7	WW, 1Ω, ±5%, 3W	1159-0001	Dale	RS-2B

Figure 3-12. High Voltage Power Supply. 3100, p. 3-63, add diodes CR15, CR16 and change the value of R7 to 1Ω ±5%, 3W, as shown below:



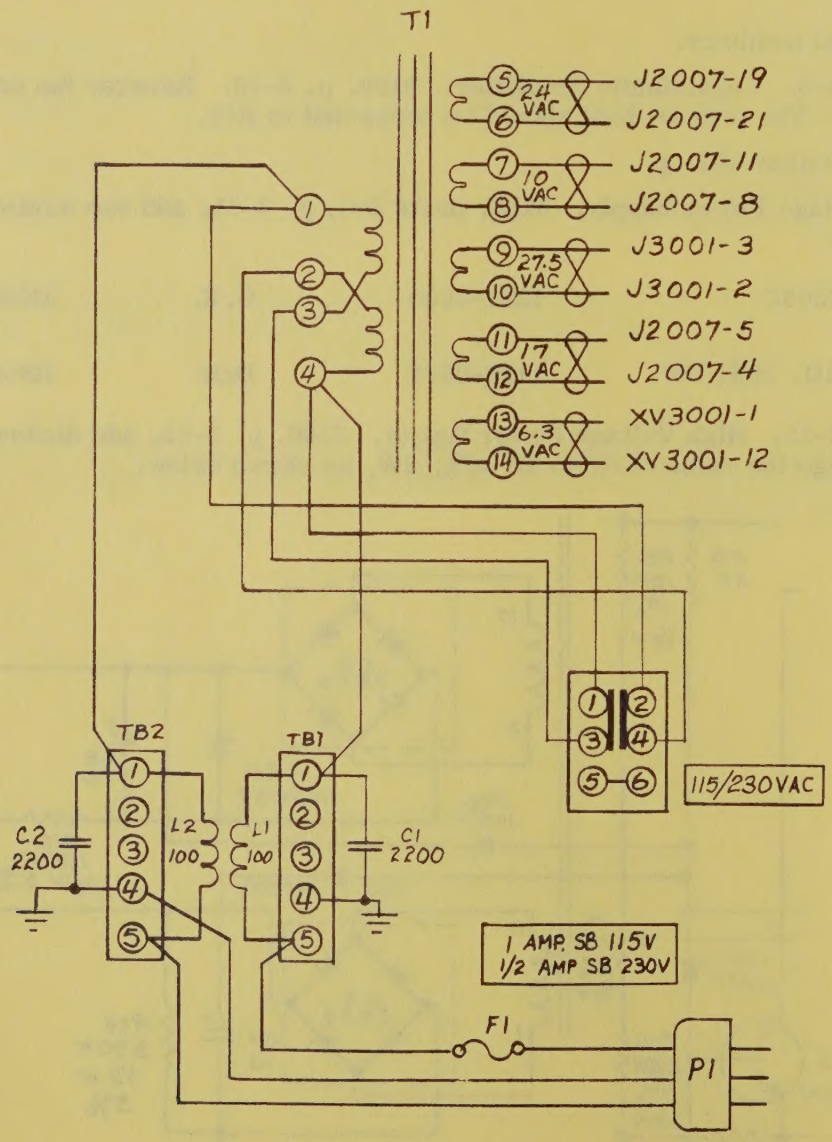
Date August 1975

Serial 241-up.

Rear Panel. 4000, parts lists, p. 3-71, delete FL1, RFI Line Filter and add the following:

C1, C2	Cer, 2200 pF, ±20%, 3 kV	1005-0098	Erie	818Y5
L1, L2	RF Choke, 100 μH, ±20%, 2 Amp	1585-0040	Miller	B-6021
TB1, TB2	Tie point, 5 pin	1760-0012	Smith	1157

Figure 3-14. Rear Panel, Interconnection Diagram. 4000, delete FL1 and add C1, C2 2200, L1, L2 100 and TB1, TB2 as shown below:



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- During the 3-year warranty period, Cushman will replace instrument printed circuit boards found to be defective. Replacement boards will be shipped directly to the customer after the instrument failure has been identified by an authorized Cushman Service Center. All replacement boards are warranteed against defective material and workmanship for a period of one year after date of shipment. Defective boards must be returned to the appropriate Cushman Service Center within 30 days after receipt of replacement boards. *

- During the 3-year instrument warranty period, a free annual calibration will be available at any authorized Cushman Service Center. *

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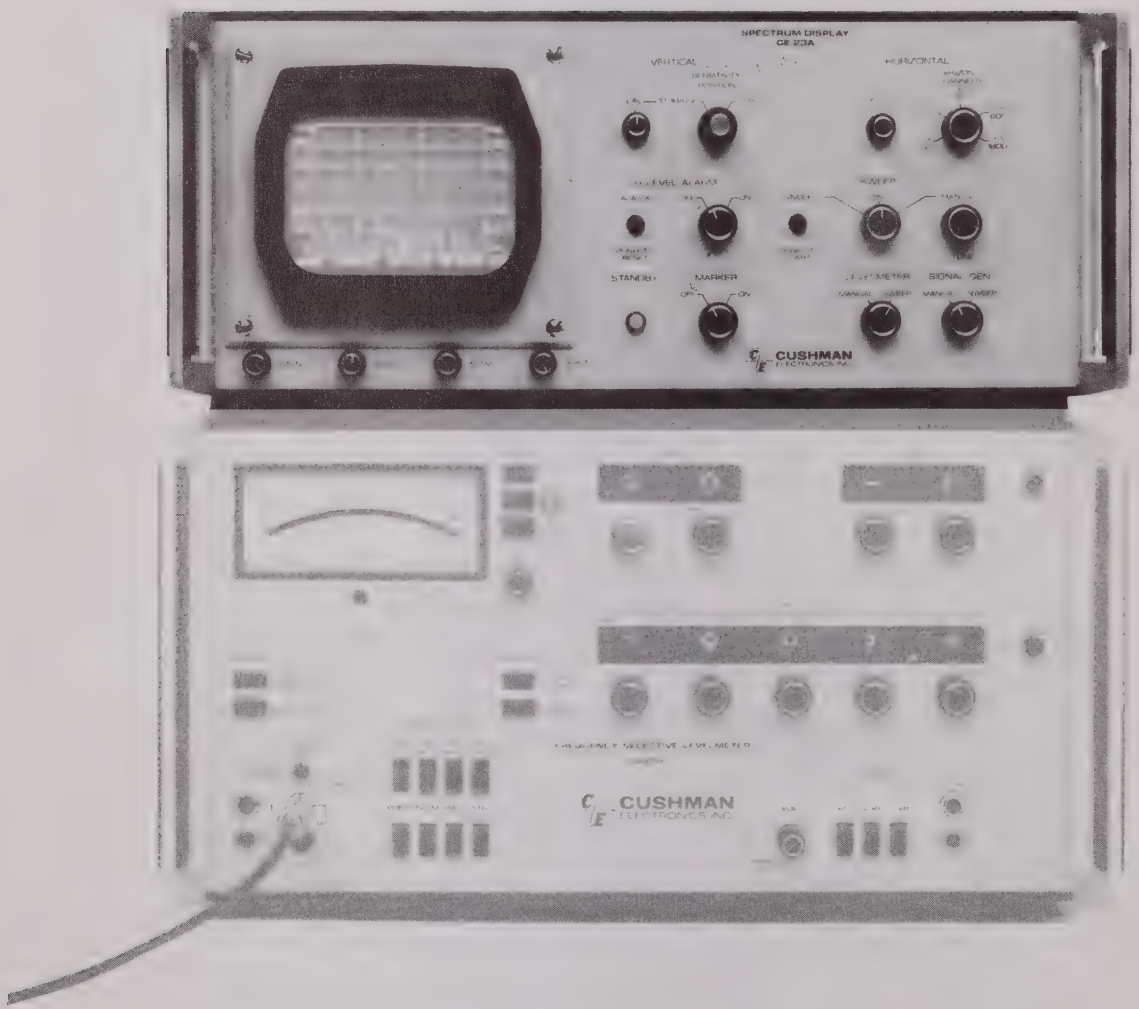

Figure 1-1. Model CE-23A Spectrum Display

SECTION 1
THEORY OF OPERATION

INTRODUCTION

1.01 In this section the Circuit Reference Series for circuit and component identification is explained, the overall functioning of the instrument is described and a description of the individual circuit boards is given.

1.02 CIRCUIT REFERENCE SERIES

1.03 The circuits of the CE-23A are referred to by the series 1000, 2000-2700, 3000-3200 and 4000-4100. 1000 is the Front Panel, 2000 is the Main Chassis, 2100-2700 are circuits that plug into the Main Chassis, 3000 is the High Voltage Chassis, 3100 is the High Voltage Power Supply, 3200 is the Deflection Amplifier, 4000 is the Rear Panel and 4100 is the RF Switch and Buffer which is attached to the rear panel.

1.04 Each component in a circuit is individually numbered. The complete identification for a component includes the circuit number. Thus the first resistor on the Variable Oscillator board will be R2401, the third transistor will be Q2403, etc.

1.05 When individual circuits are described in the Circuit Description section the component reference will be abbreviated. Only the circuit component number will be used, except when referring to a component in another circuit. In this case the full Circuit Reference Series number will be used.

1.06 Table 3-1 is a cross reference list of the P.C. board numbers and the Circuit Reference Series. The P.C. board number is etched on each board. Each board may thus be identified. These numbers, and also the assembly numbers, will be found in the parts lists.

FUNCTIONAL DESCRIPTION

1.07 The purpose of the CE-23A is to display the amplitude and relative frequency relationships of the signals in a particular bandwidth. The display is made on a Cathode Ray Tube. The CRT graticule is calibrated vertically in dB and horizontally in frequency. Signals or signals that are missing from a group thus may be identified and the amplitude and frequency of those signals present may be determined.

1.08 The Local Oscillator (L.O.) frequency from the CE-21A is brought into the CE-23A through "D" to the R.F. Switch and Buffer, 4100. Refer to Overall Block Diagram, Figure 1-2. From there it goes to the Marker/Variable Oscillator, 2400, where it is used to generate a marker to indicate on the CE-23A CRT the frequency to which the CE-21A is set. A frequency to voltage converter on this board generates a steering voltage that is used in both Master and Slave Phase Lock Loops to keep the frequency aligned with the CE-21A, within the phase lock pull-in range.

1.09 In the Phase Locked mode, Figure 1-3, the L.O. from the CE-21A (12-21 MHz) also goes from the Buffer, 4100 to the Master Phase Lock Loop, 2600. Here a frequency of 12.5-21.5 MHz is generated by a Voltage Controlled Oscillator (VCO), phase locked to the CE-21A L.O. A 500 kHz crystal oscillator fed into the loop provides the 500 kHz offset from the CE-21A L.O. frequency.

1.10 The 12.5-21.5 MHz output from the Master Phase Lock Loop goes to the Slave Phase Lock Loop, 2500, where it is used to phase lock a VCO generated frequency of 12-21 MHz. Also fed into this loop, in the phase lock mode (Figure 1-3), is the output of a 500 kHz LC or RC oscillator swept over a range of ±2 kHz, ±30 kHz or ±150 kHz bandwidths. This provides a 12-21 MHz L.O. swept over the proper bandwidth determined by the setting of the kHz/DIV switch. In the 300 kHz/DIV mode phase lock is not used, Figure 1-4. Instead the VCO is swept by the ramp voltage from the Sweep Generator and the center of the swept frequency is aligned with the CE-21A frequency by the steering voltage from the Frequency to voltage converter. In the 900 kHz/DIV mode the steering voltage is not used, but the VCO is swept from 12-21 MHz by the sweep ramp.

1.11 In the CE-21A the swept LO from the CE-23A to the first mixer (in place of the locally generated L.O.) sequentially converts the signals in the swept band to the IF of the CE-21A. They are amplified, converted to the second IF (80 kHz) and brought back to the CE-23A, through "A", to the 80 kHz Band Pass Filter, 2200. There they pass through the appropriate filter, according to the bandwidth selected, to the Logarithmic Amplifier, 2100. Here they are converted from a linear to a logarithmic amplitude response, and the IF envelope detected. This output is amplified in the Deflection Amplifier, 3200. The output of this circuit is the vertical deflection signal to the CRT.

1.12 The sweep ramp for both the swept oscillators and the horizontal sweep circuit of the CRT is generated in the Sweep Generator/Hi-Level Alarm circuit, 2300. This sweep ramp may be set for continuous repetition, or for a single sweep triggered by a front panel pushbutton, or in the manual position it may be run back and forth across any portion of the sweep width by a front panel control.

1.13 The sweep ramp also sweeps the LC or RC oscillators on the Marker/Variable Oscillator

board, 2400, or goes to the 2500 board to sweep the VCO. In each case the sweep is equally above and below the frequency setting of the CE-21A, except in the 900 kHz/DIV mode where it always sweeps the range of the instrument, 0-9.1 MHz (L.O. of 12-21.1 MHz).

1.14 The CRT display shows horizontally the full bandwidth selected by the kHz/DIV switch, with the graticule divisions indicating the frequency according to the switch setting. The CE-21A frequency setting is at the center of the display except on the 900 kHz/DIV range. On this range the center of the sweep is always 4.5 MHz. The marker can be set to any point on the sweep by tuning the CE-21A.

CIRCUIT DESCRIPTION

1.15 MASTER PHASE LOCK LOOP. 2600

1.16 In this circuit, Figure 3-9, the 12-21 MHz LO output from the CE-21A is mixed with the output of the 12.5-21.5 MHz Voltage Controlled Oscillator (VCO) to produce a 500 kHz output. This output is compared to the output of a crystal controlled oscillator in a phase detector. The output of the phase detector is used to control the frequency of the 12.5-21.5 MHz VCO, thus forming a phase lock loop in which the 500 kHz offset is determined by the crystal oscillator and the 12.5-21.5 MHz frequency is phase locked to the 12-21 MHz frequency from the CE-21A. A steering voltage, generated in a Frequency to Voltage converter, on board 2400, by the 12-21 MHz L.O. from the CE-21A, brings the VCO within locking range whenever the CE-21A frequency is changed.

1.17 The output from the 500 kHz oscillator, Q15, Q16, Y1, passes through current mode switch, Q13, Q14, a saturating amplifier which converts the sine wave to essentially a square wave. One output through Q12 goes to the marker through board pin 2 and the other through Q11 goes to the phase detector, IC2.

1.18 The 12.5-21.5 MHz VCO is Q6 with tuning varicaps CR6-CR8 and output buffers Q5, Q7. Q8 regulates the collector supply for Q5, Q6, Q7 for maximum oscillator stability. Output through Q7 goes to the Slave VCO through board pin 21. Output through Q5 goes through the power amplifier Q3, Q4 and matching transformer, T3, to the Double Balanced Mixer, T1, T2, CR2-CR5, through T2. The other input to the mixer is the 12-21 MHz LO from the CE-21A through board pin 10 and buffer amplifier Q1, Q2 to T1.

1.19 Output from the Balanced Mixer passes through the 4 MHz low pass filter, to remove high frequency components, through Differential Comparator, IC1, to the other input of the phase detector, IC2. IC1 changes the sine wave input to a square wave (logic levels) output. Output from the phase detector passes through a 200 kHz low pass filter, which reduces sidebands, and active filter IC3, the response of which is set so as to ensure loop stability. Q9, Q10 operate only to bring the output voltage from the phase detector back into phase loop locking range in case it should tend to latch up after turn on or when shifting frequencies. CR9-CR12 limit the range of the control voltage to the summing amplifier, IC4.

1.20 Output from the Frequency to Voltage converter on the Marker/Variable Oscillator board, 2400, comes in through board pin 19, through the gain and offset network to the steering amplifier, IC5. Output from IC5 is summed with the loop control voltage at the input to the summing amplifier IC4. Output from the summing amplifier goes to the varicaps CR6-CR8 in the VCO to control the frequency.

1.21 The steering voltage is set so that the voltage applied to the varicaps brings the VCO very close to the proper frequency so that it is always kept within the locking range of the phase lock loop after a Frequency change or when the instrument is turned on.

1.22 SLAVE PHASE LOCK LOOP. 2500

1.23 The purpose of the Slave Phase Lock Loop, Figure 3-8, is to generate a 12-21 MHz LO that may be linearly swept over selected bandwidths, (4 kHz, 60 kHz, 300 kHz, 3 MHz) that are centered on the frequency to which the CE-21A is set, and also over the full 0-9.1 MHz band (12-21.1 MHz).

1.24 The 12-21 MHz VCO is Q6 with tuning varicaps CR7-CR9. Collector current to Q6 is regulated by Q5 for maximum stability. Four outputs are provided through buffers Q7, Q13, Q14, Q15. Output through Q13 goes through buffer amplifier, Q1, Q2 to matching transformer, T1. Output from T1 goes to T2 of the Double Balanced Mixer, T2, T3, CR2-CR5.

1.25 The 12.5-21.5 MHz output of the Master Phase Lock Loop enters the board through pin 2, is amplified by Q3, Q4 and applied to the other input of the Balanced Mixer, T3. The 500 kHz output of the mixer passes through a 4 MHz low pass filter to remove the high frequency components. Differential comparator IC1 changes the sine wave input to a square wave (logic levels) and the output is applied to one input of phase detector, IC2.

1.26 The other input to the phase detector is the output of the Variable Oscillator, 2400, which varies around a center frequency of 500 kHz according to the setting of the kHz/DIV switch. (Output is 500 kHz ±2 kHz at 0.4 kHz/DIV, 500 kHz ±30 kHz at 6 kHz/DIV and 500 kHz ±150 kHz at 30 kHz/DIV.) Output from the phase detector passes through a 200 kHz low pass filter to remove sideband frequencies and through active filter, IC4. The response curve of IC4 is such that it ensures overall loop stability. Q8, Q9 operate to bring the output voltage of the phase detector back into phase

lock loop locking range in case the range of the phase detector is exceeded, causing it to "latch up," after instrument turn-on or when shifting frequencies. CR10-CR13 limit the range of the control voltage to the summing amplifier, IC6, providing an operating window to limit possible frequency excursions of the VCO. A steering voltage from the Frequency to Voltage converter on board 2400, enters through pin 11, is amplified by IC3 and connected to the input of the summing amplifier, IC6. Output from IC6 goes through switch, Q11, to the linearizer circuit and then to the varicaps of the VCO. Switch Q11 is closed when the kHz/DIV switch is in the 0.4,6, 30 kHz/DIV positions only.

1.27 When the kHz/DIV switch is in the 300 or 900 kHz/DIV positions, switch Q11 is open and switch Q12 is closed. Switch Q10 is closed in the 300 kHz/DIV position only. In the 300 kHz/DIV position the steering voltage from the Frequency to Voltage converter enters through pin 11, is adjusted by Steer Gain control, R67, and Steer Offset control R72, amplified in IC3, IC5, passed through Q10 and applied to the summing amplifier IC7. In this position of the kHz/DIV switch the output of the Ramp Generator on the Sweep Generator/High Level Alarm board, 2300, enters through pin 14 and is also applied to summing amplifier, IC7 through adjustment control R90, which adjusts the sweep width. Output from IC7 goes through switch, Q12, to the linearizer circuit of IC8 and then to the varicaps of the VCO.

1.28 In the 900 kHz/DIV position switch Q10 is opened and the Ramp Generator output enters the board through pin 16, through sweep width adjustment control, R97, to IC7. This is the only input to IC7 in this bandwidth position. Output passes through Q12, IC8 to the varicaps to control the VCO frequency.

1.29 The linearizer circuit is necessary to compensate for the non-linearity of the VCO in order that the swept L.O. may have the same linearity as the CRT sweep. The basic center frequency of the VCO is set by the Bias control, R121. The slope of the VCO output is set with R117 (G2), the lower portion is adjusted with R108 (G1) and the upper portion with R113 (G3).

1.30 VARIABLE OSCILLATORS. 2400

1.31 This circuit provides the variable frequencies which are applied to the phase detector in the Slave Phase Lock Loop circuit to cause the variable LO output to be swept over the required bandwidth in the 0.4, 6 and 30 kHz/DIV positions of the kHz/DIV switch. An LC oscillator is used for the 0.4 kHz/DIV bandwidth and an RC oscillator for the 6 and 30 kHz/DIV bandwidths. See Figure 3-7.

1.32 The LC oscillator is a VCO, Q22,Q23 with tuning varicaps, CR4, CR5, controlled by the ramp voltage from the sweep generator. Output frequency is 500 kHz ±2 kHz. The sweep ramp voltage enters through pin U, is buffered by IC15 and applied to the varicaps CR4, CR5. Sweep width is adjusted by R89. The center frequency of the oscillator is set by adjusting L1. Output is taken from the top of L1, the high input impedance of Q24 provides light loading. Q24, Q25 are the output amplifier and current mode switch, Q26, Q27, squares up the sine wave to provide a logic level output. The output is inverted, IC19-2,3 and passes through IC19-10, 8 which operates as an OR gate. The input to IC19-9, 10, 8 from the oscillator that is not used is always high so that the logic levels applied from the oscillator in use will be inverted and pass through it. The LC oscillator is turned on by +12V from the kHz/DIV switch, S1007, applied through board pin H, when the switch is in the 0.4 kHz/DIV position.

1.33 The RC Oscillator is an astable multivibrator, Q16, Q17. The frequency is adjusted by the current applied to the base of each transistor by the constant current sources Q18 and Q28. Current is supplied to these sources and the amplifiers IC14 and IC16 by a +15V regulator IC17, Q20. Collector current for the multivibrator is supplied by the +5V regulator, IC18, Q21. See Figure 3-7. The frequency of the oscillator is 500 kHz ±30 kHz in the 6 kHz/DIV position and 500 kHz ±150 kHz in the 30 kHz/DIV of the band switch S1007.

1.34 The frequency is caused to vary by the ramp voltage from the sweep generator which enters the board from the kHz/DIV switch S1007 through board pin W in the 6 kHz/DIV position, and through pin X in the 30 kHz/DIV position. Input through pin W is controlled by R59 to adjust the 60 kHz bandwidth. Input through pin X is controlled by R58 to adjust the 300 kHz bandwidth. R60 is used to set the center frequency of the oscillator to 500 kHz. The sweep is inverted in buffer amplifier IC13 and applied to the non-inverting input of IC14 and IC16. These amplifiers drive the constant current sources Q28 and Q18 to sweep the frequency of the RC oscillator Q16, Q17. Output is buffered through Q19 to the OR gate IC19-9, 8, and to the Slave VCO phase detector through board pin C.

1.35 MARKER AND FREQUENCY TO VOLTAGE CONVERTER. 2400

1.36 The Marker circuit generates a sharp pulse on the CRT display which indicates the frequency to which the CE-21A is tuned. This pulse consists of a one millisecond pulse of 20 kHz oscillations.

1.37 In the .4, 6, 30 kHz/DIV modes an output from the LC or RC oscillator is connected to the input of phase detector, IC4, through AND gate IC3-1,3,4,6. At the same time an output from the 500 kHz crystal oscillator on board 2600 is connected to the phase detector, IC4, through AND gate IC2-5,6,9,8. When these two frequencies coincide (the LC or RC oscillator sweeps through 500 kHz) the phase detector generates an output. Since the sweep is centered on 500 kHz, this coincidence point represents the center of the sweep.

1.38 Output from IC4 triggers the threshold detector, Q5, Q6, which in turn triggers the one millisecond one-shot IC5-13, 8, as long as the MARKER switch is in the ON position. The one millisecond pulse from the one-shot turns on the 20 kHz multivibrator, IC5-4, 3, 6 to produce the marker. Marker output is applied to the CRT trace through the Vertical Deflection amplifier.

1.39 In the 300 and 900 kHz/DIV mode, input to the phase detector is 12-21 MHz from the Slave VCO, 2500, through the Current Mode Switch, Q1-Q4, which shapes the input to IC1 to approximately a square wave. IC1 divides the input frequency by ten and the output is applied through AND gate IC2-13, 11, 10, 8 to phase detector IC4. An output from the CE-21A synthesizer enters through current mode switch, Q7-Q10, through IC6, which divides by ten, through AND gate IC3-13, 11, 5, 6 to phase detector, IC4. When these two frequencies coincide, which will be when the CE-23A VCO passes through the frequency to which the CE-21A is tuned, IC4 produces an output and the Marker pulse is generated as described above.

1.40 FREQUENCY TO VOLTAGE CONVERTER. 2400

1.41 The output of the Frequency to Voltage Converter, the Steering Voltage, is used in the phase locked mode (.4, 6, 30 kHz/DIV) to bring the Master and Slave VCO's within the phase lock range at the correct frequency as determined by the frequency dialed in on the CE-21A. In the 300 kHz/DIV position, the steering voltage centers the sweep ramp on the frequency to which the CE-21A is tuned. In the 900 kHz/DIV mode this output is not used.

1.42 The output of IC6 also goes to the two divide by ten circuits, IC7, IC8, for a division by 100, to the inverter IC10-12, 11 and then to the flip-flop latch IC10-1, 6. The latch is turned on, output high, by the signal out of IC8. It is turned off by the sweep generator Q15 and threshold detector IC9. The slope of the sweep generator ramp is a function of R37, C30. The comparator level for IC9 is the voltage drop across R35. The time the latch is on is the same for each cycle. The time it is off is determined by the signal frequency from IC8, therefore the overall duty cycle of the latch output is directly proportional to frequency.

1.43 The latch output through pulse shaper, Q11-Q14, is tied to definite levels between 0 and 5 volts. IC11 is connected as a 3-pole active filter to convert the pulse output to a DC voltage that is proportional to frequency. IC12 buffers the output to provide the steering voltage through board pin P.

1.44 SWEEP GENERATOR. 2300

1.45 This circuit generates the ramp voltage which controls the horizontal deflection amplifier of the CRT and sweeps wither the LC or RC oscillator or the Slave VCO. Three sweep repetition rates are generated, 2.2 Hz (450 ms) for the 6, 30 & 300 kHz/DIV modes, 1.0 Hz (1000 ms) for the 900 kHz/DIV mode and 0.5 Hz (2000 ms) for the 0.4 kHz/DIV mode. See Figure 3-5.

1.46 The ramp is generated by charging C8 through switch, Q6, and charging resistor R2, R4 or R5 as selected by the kHz/DIV switch. The ramp is buffered by IC2 and applied to the Horizontal Deflection amplifier through board pin K. The ramp is also connected to IC3, IC4 which control the flip-flop IC5 to generate the reset and blanking pulse. The blanking pulse goes through board pin X, through S1008 and S1006 to the blanking amplifier. The reset pulse from IC5-6 is connected to the input of switches Q2, Q4 to turn off Q6, and to Q3, Q5 to turn on Q7. This discharges C8, generating the retrace sweep. At the end of the retrace Q6 is again turned on and Q7 turned off, when IC5 changes state at the end of the retrace.

1.47 An output from IC2 is connected to IC9 where it is inverted, amplified and fed out through board pin 10 to the kHz/DIV mode switch to be properly routed to the LC or RC oscillators or to the Slave VCO. Sweep position is adjusted with the HORIZONTAL POSITION control as it adjusts a DC bias to the input of IC9 through board pin 8.

1.48 In the SINGLE SWEEP mode the output to the blanking amplifier is taken from board pin Y instead of X. When the Single Sweep PUSH TO START switch is depressed there is a closure to ground through board pin U and a pulse is applied to IC6-13 through C17 to set the flip-flop IC6-13, 11, IC6-1, 3. When the flip-flop is set IC6-10, 4 is enabled so that at the end of the reset pulse from IC5-6 to IC6-9, 5, IC8-8 goes low to unblank the trace for one sweep and IC8-6 goes high to turn on switch, Q10 to cause the SINGLE SWEEP light to be lighted. The reset pulse from IC5-6 resets IC6 and IC8. Since the charge has been restored on C17 through R30, another sweep is not unblanked until the PUSH TO START switch is again depressed.

1.49 In the MANUAL mode the CRT trace is unblanked by a switch contact on S1008, and +20V, instead of -12V, is applied to the junction of CR1 and CR2. This voltage turns on Q1 and applies a positive bias to the base of Q5 to keep Q7 biased off. A voltage, adjusted by the MANUAL TUNE control, connected through board pin B and Q1, and applied to IC2-5, adjusts the CRT beam across the screen according to the setting of the control.

1.50 HI-LEVEL ALARM. 2300

1.51 An output from the Logarithmic amplifier is connected to Voltage Comparator IC1 through board pin N. Whenever the level exceeds the level set by R37 there is an output to IC10-10, which allows the pulse output of the flip-flop IC5-3, generated by the sweep ramp, to pass through IC10-9, 8, 1, 3 to the input of counter, IC7. At the third count, third sweep, IC7-6, 11 output to IC11-9, 10

causes a change of state at IC11-8, 6 to turn on switch, Q11. With Q11 on the ALARM light is lighted and the Hi-Level Alarm relay is energized. The logic is now locked in this state until the PUSH TO RESET button is depressed or the HI-LEVEL ALARM switch is turned to OFF. The reset state causes Q8, Q9 to generate an output to reset IC7, which turns off the ALARM light and de-energizes the Hi-Level Alarm relay. In case IC1 does not hold IC10-10 in an on state for three sweeps, a reset pulse from IC11-11 causes Q8, Q9 to generate an output to reset IC7.

1.52 RF SWITCHES AND BUFFER. 4100

1.53 This circuit controls the input and output RF signals by means of PIN diode switches. Each switch is made up of a pair of PIN diodes, such as CR1, CR2, which are turned on, switch closed, by applying +20V to the junction of the diodes through a decoupling filter, such as L1, C3, C4 and isolating resistor, such as R2 with C2. C2 provides more complete isolation when the switch is open. To open the switches a -12V is applied to the junction of the two diodes. The front panel controls are the LEVELMETER and SIGNAL GEN switches. The buffer amplifiers supply additional gain and isolation where necessary. Transformer coupling is used where necessary to break up DC ground loops. Refer to Figure 3-15.

1.54 80 kHz BAND PASS FILTER. 2200

1.55 The three bandpass filters restrict the second IF bandwidth as necessary for the more narrow sweepwidths. See Figure 3-4. For the 300 and 900 kHz/DIV sweepwidths the IF channel provides sufficient selectivity so only a matching pad is necessary to provide the same loss as the filters. Each filter is switched in according to the setting of the kHz/DIV switch. The filter switches are FETS at the input and output to each filter. The 45 Hz crystal filter is mounted external to the board but the FET switches are mounted on the board. Overall gain is adjusted with R3 using the 400 Hz filter. The other filters and the impedance matching pad are adjusted for the same output using the adjustable controls R15, R23, R32.

1.56 LOGARITHMIC AMPLIFIER. 2100

1.57 The Logarithmic Amplifier, Figure 3-3, takes the linear amplitude input signal and transforms it into a logarithmic response for the CRT display. The logarithmic amplifier, IC2, contains four logarithmic amplifiers, each having a 30 dBV range. Outputs are summed together to give one logarithmic output. To make use of the full dynamic range, the input signal is connected, through the tuned input amplifier Q1, Q2, to the four logarithmic amplifiers, one at input level, one at -30 dB through the 30 dB attenuator, Q7, one at +30 dB through 30 dB amplifier Q3, Q5, Q8 and one at +60 dB through 30 dB amplifier Q4, Q6, Q9.

1.58 Output of the logarithmic amplifier is detected in IC3 and is filtered in the active filter circuit of IC4. Output of IC4 goes to the Vertical Sensitivity switch on the front panel and from there back to IC1 through board pin 11 or 12, as selected by the Vertical Sensitivity switch. IC1 is a unity gain operational amplifier when the input is through board pin 11 and is a X10 amplifier when the input is through board pin 12. Some filtering action is also provided by the circuit of IC1.

1.59 DEFLECTION AMPLIFIER. 3200

1.60 The Deflection amplifier circuits contain the Horizontal amplifier, the Vertical amplifier, and the Blanking amplifier. Both the Horizontal and the Vertical amplifier convert the input signal from single ended to push-pull for the CRT deflection plates. See Figure 3-13.

1.61 The Horizontal amplifier is made up of Q1, Q2, Q3 and Q4, Q5, Q7 with Q6 serving as a current source in the emitter circuit of Q3, Q4 to aid in maintaining sweep linearity. Horizontal gain is set with R6 and the position with R15. The output drives the deflection plates of the CRT directly.

1.62 The Vertical amplifier is the same as the horizontal amplifier, the amplifiers being Q8, Q9, Q10 and Q11, Q13, Q14, with Q12 serving as a current source for Q10, Q11. Preceding this amplifier is a buffer, IC1. In the input of this buffer, the two clipping circuits, adjusted by R22 and R24, prevent the Vertical amplifier from being driven more than is necessary to give the full amplitude of the vertical trace on the CRT. The vertical amplifier also drives the deflection plates of the CRT directly. The Marker deflection pulse is applied through board pin 18 and amplifier, Q17, to the base of vertical deflection amplifier Q14.

1.63 The Blanking pulse from the Ramp generator through board pin 10 is amplified by IC2 and Q16. Q15 is a current source to maintain a fast rise time when Q16 is turned on. Output through board pin 13 is a negative pulse to the CRT grid to turn off the beam during retrace.

1.64 HIGH VOLTAGE POWER SUPPLY. 3100

1.65 The output of a 26V winding on the power transformer is rectified by Z1 and applied to two series regulators. Q3 using voltage reference, CR3, supplies +33V for IC1. Series regulator Q3001 supplies the current to the oscillator of the high voltage supply. IC1 is the control amplifier for the High voltage supply regulator, CR4 is the voltage reference and Q4, R7, limit the short circuit current. Regulator output voltage is set by R9. DC is supplied to the Oscillators Q1, Q2 through T2. T1 is the oscillator tank circuit. Four secondaries of T2 supply the four rectifier circuits to provide the required voltages. See Figure 3-12.

1.66 Two voltage tripler rectifiers CR5, CR7, CR13 and CR6, CR8, CR14 provide the negative high voltages. The voltage to the CRT cathode

through board pin 12 is referenced to ground and the voltage to the CRT grid is referenced to the output of the blanking amplifier. Blanking is accomplished by driving the CRT grid sufficiently negative to cut off the beam current. R11 sets the INTENSITY control range. FOCUS and ASTIG. controls adjust voltages on the CRT electrodes. +240V through board pin 10 and +100V through board pin 8 are used in the Deflection amplifier circuits.

1.67 LOW VOLTAGE POWER SUPPLY. 2700

1.68 Three rectifier and four regulator circuits provide the required +20V, +12V, +5V and -12V outputs. The same rectifier supplies both the +20V and +12V regulators. The series regulator transistors for these circuits Q4001, Q4002, Q4003, Q4004 are mounted on the rear panel which serves as a heat sink. The control amplifiers are IC1-IC4 and these are adjusted by R8, R11, R24, R35. Regulator driver transistors are Q1, Q3, Q4, Q6 and short circuit protection is provided by Q2, Q5, Q7. CR6 is the voltage reference for the +20V, +12V, +5V regulators and CR17 is the voltage reference for the -12V regulator. See Figure 3-10.

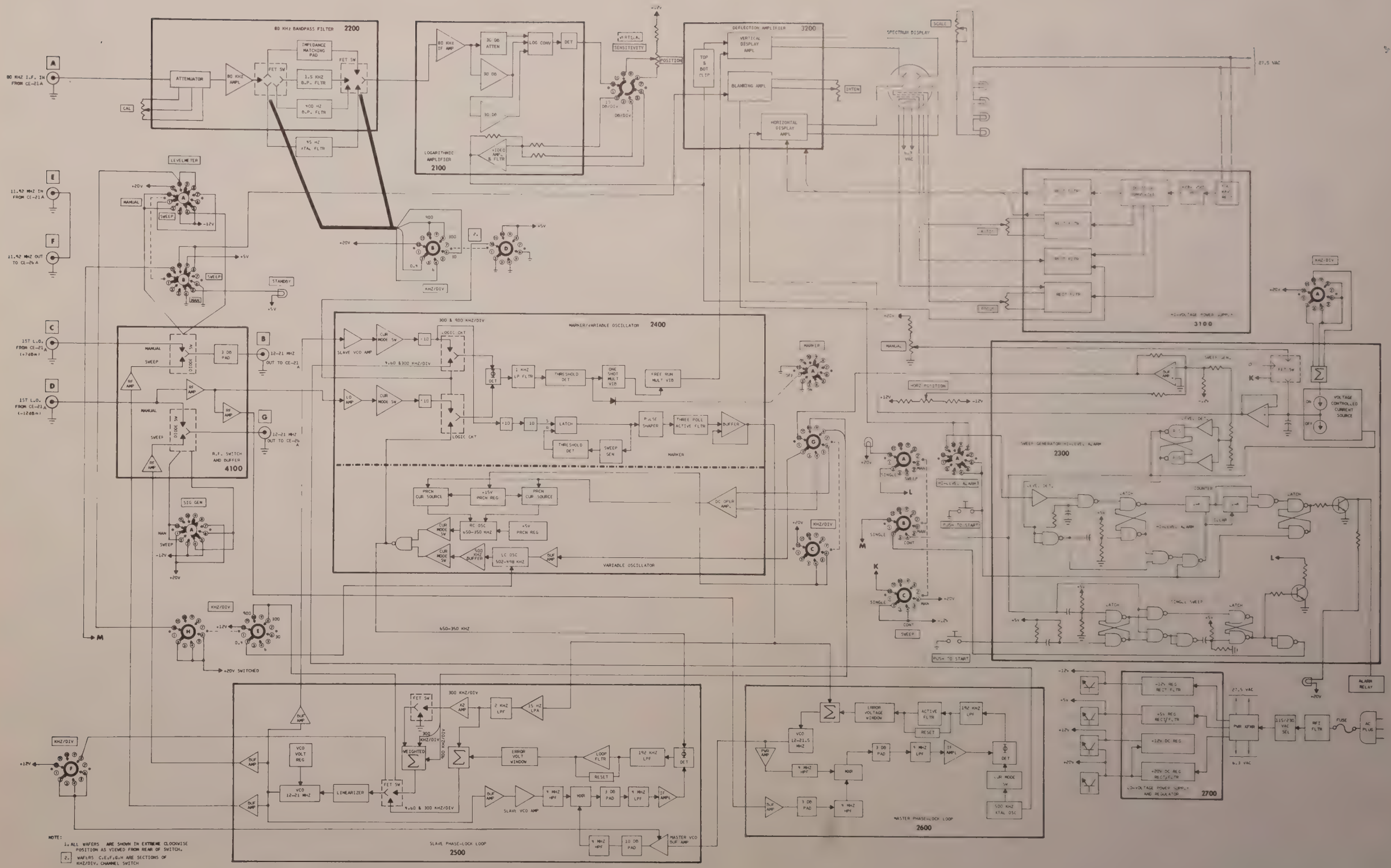

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Figure 1-2. Overall Block Diagram

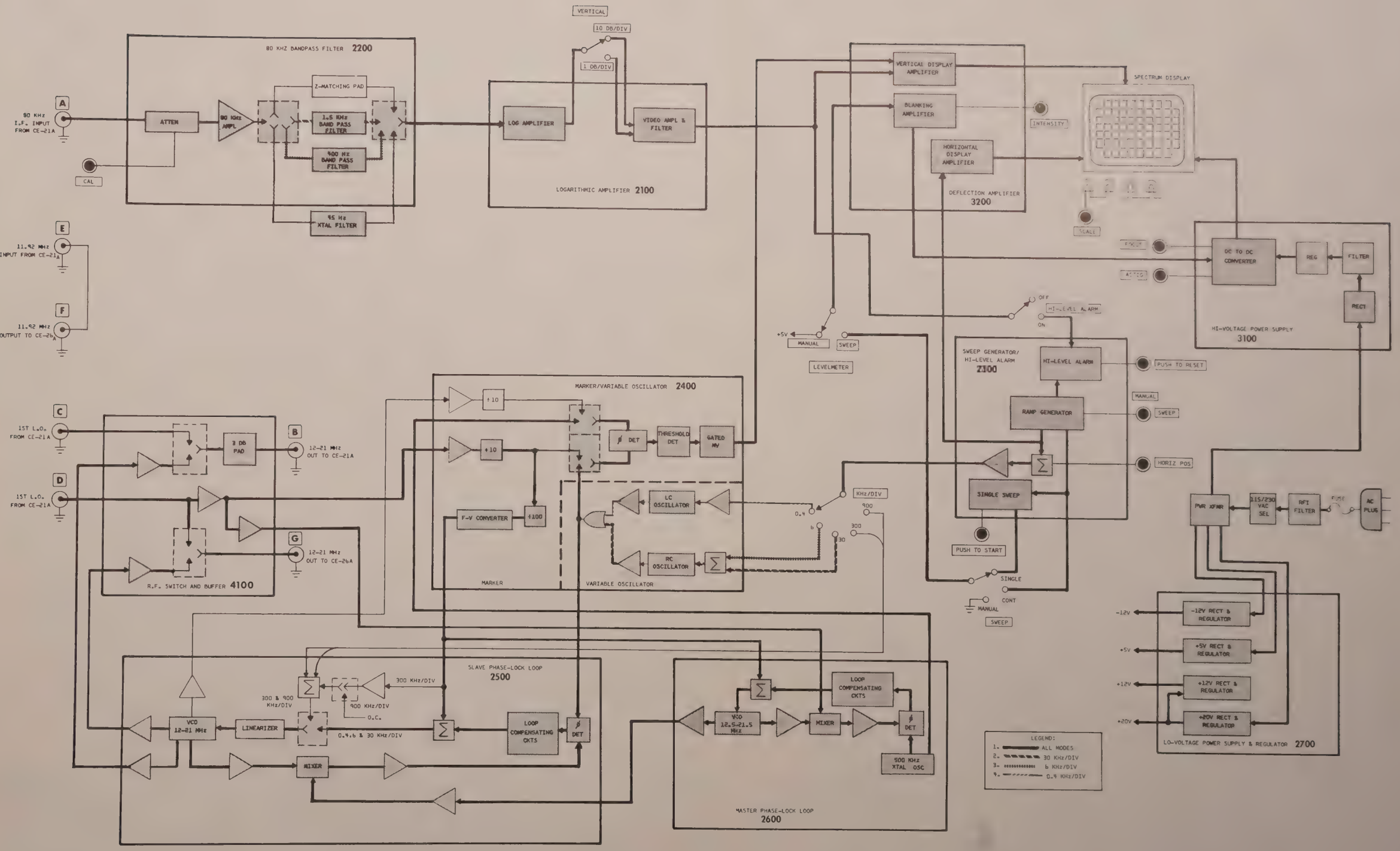

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Figure 1-3. Phase Lock Loops, Block Diagram

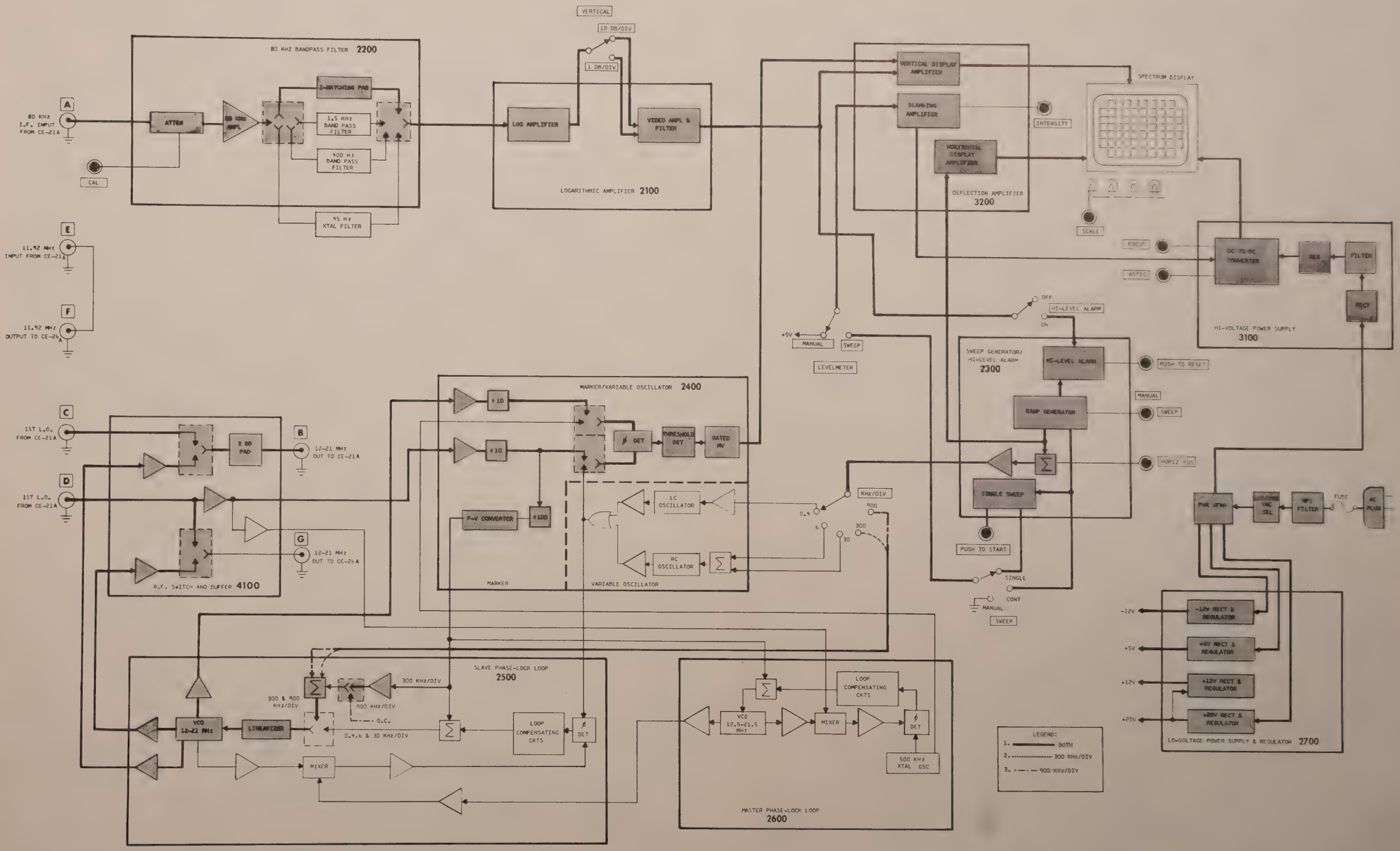

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Figure 1-4. Steering Modes, Block Diagram

SECTION 2
MAINTENANCE

GENERAL

2.01 This section of the manual contains the information necessary to check the performance and to calibrate and adjust the CE-23A Spectrum Display unit.

2.02 Performance checks may be used to verify proper operation or as an incoming inspection check. Calibration and adjustment procedures should be followed if the Performance Check indicates out of tolerance operation.

2.03 If adjustment procedures fail to correct the out of tolerance operation and the cause of the trouble is not readily apparent or easily repairable, it is recommended that the faulty circuit board or the whole instrument be returned to the factory or a Service Center for repair. Always contact the Cushman Electronics Customer Service Department before shipping equipment to either a Service Center or the factory. See Paragraphs 2.36 - 2.40.

2.04 PRELIMINARY INSTRUCTIONS

a. Turn on the CE-23A and allow it to warm up a few minutes before beginning the Performance Checks.

b. Figure 2-1 shows the arrangement of the circuit boards and the location of the circuit adjustments.

c. The circuit board extenders and board extractor are mounted in the CRT compartment next to the Vertical Deflection amplifier and the high voltage power supply.

d. When comparing the CRT trace with the graticule lines bear in mind the possible error in reading due to parallax. Since the trace is separated from the graticule by the thickness of the CRT faceplate the graticule must be viewed from a point directly perpendicular to the trace to prevent parallax error.

e. Whenever a board is to be elevated or replaced in its connector, turn off the power to the instrument.

PERFORMANCE CHECK

2.05 EQUIPMENT REQUIRED

Frequency Selective Levelmeter	CE-21A
Signal Generator	CE-26A
5 BNC to BNC 75Ω coax cable 12" long	
2 BNC to BNC 75Ω coax cables 3 ft long	

2.06 TEST SET-UP

a. If the CE-21A has never been used with a CE-23A the internal jumpers connecting J4006 and J4007 must be disconnected. These are the two BNC jacks labelled with a red "A". For future independent use of the CE-21A a short BNC to BNC cable must be used to connect these two red "A" jacks.

b. Connect the corresponding connectors together between the CE-21A and CE-23A, black A to black A, black B to black B, etc. Connect the corresponding black letters together between the CE-23A and the CE-26A. (Disregard the red letters in this setup. They are used only when the CE-21A and the CE-26A are connected together without a CE-23A.)

2.07 CONTROL SETTINGS ON INSTRUMENTS

a. CE-21A

METER	OFF (One push button depressed slightly until both come out.)
dB1, dB2	0 dB
MODE	LOW NOISE
BANDWIDTH	2.3 kHz
INPUT	UNBAL, TERM
IMPEDANCE	75Ω
FREQUENCY	4500.0 kHz
VOL	Just out of PWR OFF

b. CE-26A

OUTPUT	ON
TUNING	EXT
POWER	ON
OUTPUT	UNBAL, 75Ω
LEVEL	0 dB
FINE	Adjust Meter to 0 dB
FREQUENCY	4500.0 kHz

c. CE-23A

VERTICAL	10 dB/DIV
CAL	MIDRANGE
HI LEVEL ALARM	OFF
MARKER	OFF
HORIZONTAL	900 kHz/DIV
POSITION	MIDRANGE
SWEEP	CONT
LEVELMETER	SWEEP
SIGNAL GEN	MANUAL

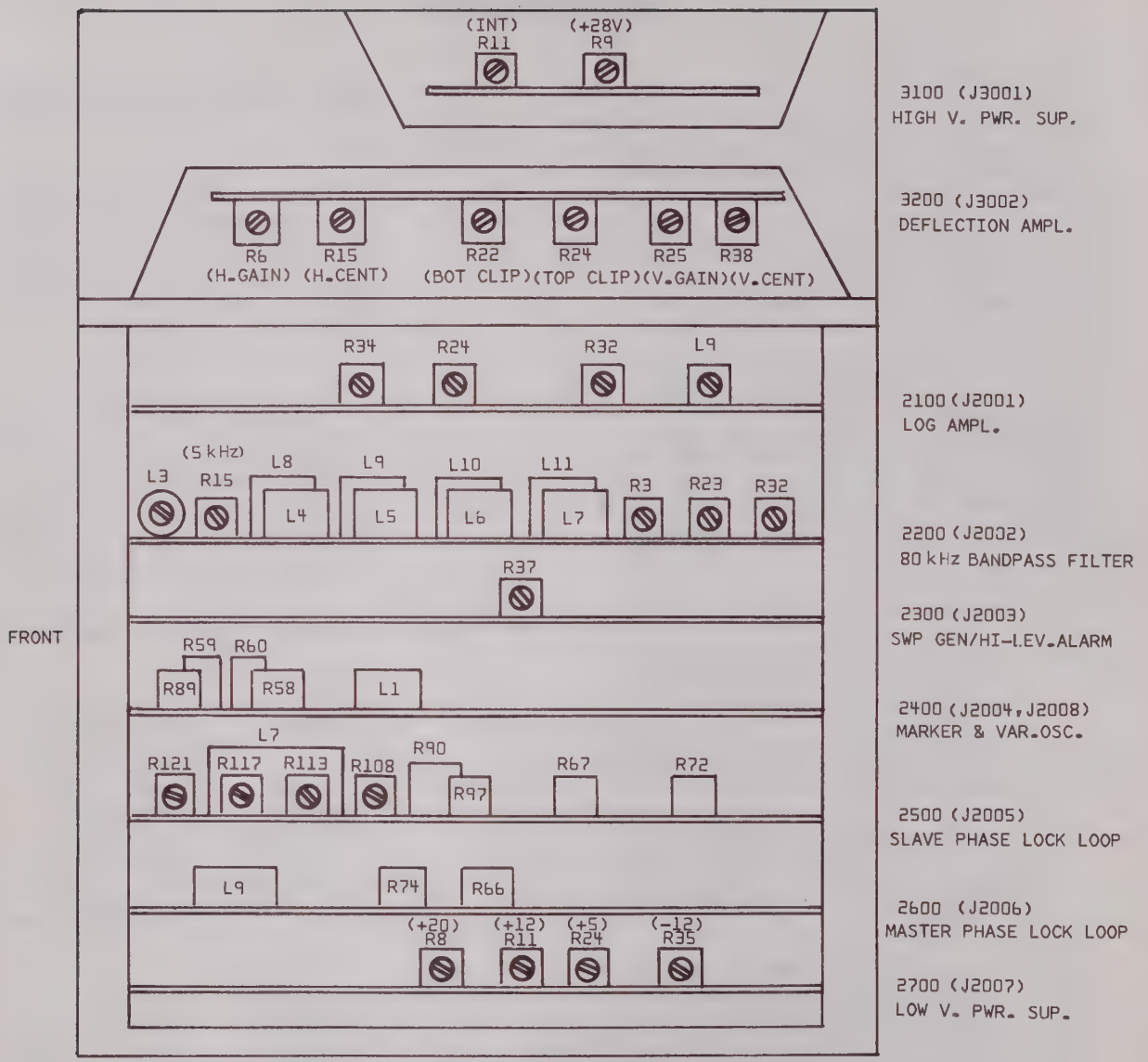

Figure 2-1. Model CE-23A Circuit Board and Adjustment Locations

2.08 CRT TRACE

a. Turn INTENSITY control CW until a horizontal trace appears along the bottom edge of the CRT screen. Turn control fully CCW. Trace should disappear. Turn control clockwise until trace is just visible. Control should be at 1/4-1/3 CW of full range. Turn up to a comfortable viewing level.

b. Adjust FOCUS control for the narrowest trace in the center section. Adjust ASTIGMATISM for narrowest trace at the two ends. Repeat adjustments since they interact slightly.

c. Turn LEVELMETER switch to MANUAL. CRT trace should disappear and yellow STANDBY light should come on. Turn switch back to SWEEP.

d. Turn SWEEP switch to SINGLE. Trace should disappear. Depress PUSH TO

START button. A single trace should go across the CRT and pushbutton light should come on for the duration of the trace. There should not be another trace until the button is again depressed.

e. Turn SWEEP switch to MANUAL. TUNE control should move CRT spot across the screen as control is turned. Set sweep switch back to CONT.

2.09 SIGNAL CENTER ACCURACY

a. Set controls as in para 2.07. Set top of signal to 0 dB line with CAL control. Set the signal to the center vertical graticule line with the POSITION control. Set CE-21A dB1 to -30 dBm.

b. Set the kHz/DIV switch to each of the five positions. Signal should stay within ±2 divisions of the center line.

2.10 HORIZONTAL LINEARITY

a. Set instrument controls as in para. 2.07 except set CE-21A dB1 to -70 dBm. Set CE-26A TUNING to INT, FREQUENCY to 900 kHz and LEVEL to +9 dBm. (The eleven vertical signals that appear are harmonics of 900 kHz generated due to overloading the CE-21A first mixer.)

b. Align the center signal to the center graticule line with the POSITION control. The other signals should line up with the graticule lines ±0.3 division.

c. Set CE-23A to 300 kHz/DIV. Set CE-26A to 300 kHz. Align the center signal to the center graticule line with the POSITION control. The other signals should line up with the graticule lines ±1 division.

d. Set the CE-21A to 2.000 MHz and to 7.000 MHz. Align center signal and check each as in step c.

e. Set CE-21A to 4.500 MHz and LEVEL to -30 dBm. Set CE-26A to 4.500 MHz and LEVEL to -20 dBm. Set CE-23A to 30 kHz/DIV and align the signal to the center graticule line. Set the CE-26A to the following frequencies. The signal should fall on the following vertical graticule divisions ±0.2 division:

4.350 MHz	-5 graticule line
4.410 "	-3 graticule line
4.470 "	-1 graticule line
4.530 "	+1 graticule line
4.590 "	+3 graticule line
4.650 "	+5 graticule line

f. Set the CE-26A to 4.500 MHz. Set the CE-23A to 6 kHz/DIV. Align signal to center graticule line with the POSITION control. Set the CE-26A to the following frequencies. The signal should fall on the following graticule lines ±0.2 division:

4.470 MHz	-5 graticule line
4.482 "	-3 graticule line
4.494 "	-1 graticule line
4.506 "	+1 graticule line
4.518 "	+3 graticule line
4.530 "	+5 graticule line

g. Set the CE-26A to 4.500 MHz. Set the CE-23A to 0.4 kHz/DIV. Align the signal to the center graticule line with the POSITION control. Set the CE-26A to the following frequencies. The signal should fall on the following graticule lines ±0.3 divisions.

4.4980 MHz	-5 graticule line
4.4988 "	-3 graticule line
4.4996 "	-1 graticule line
4.5004 "	+1 graticule line
4.5012 "	+3 graticule line
4.5020 "	+5 graticule line

2.11 VERTICAL LINEARITY AT 10 dB/DIV

a. Set the instrument controls as in para. 2.07 except set CE-23A to 30 kHz/DIV. Adjust CAL control for a signal level on the 0 dB graticule line.

b. Set CE-26A LEVEL to -10 dBm. Signal should drop to the -10 dB graticule line ±2 dB. Set CE-26A LEVEL to -20 dBm. Signal should drop to the -20 dB graticule line ±2 dB.

c. Reset the CE-26A to 0 dBm. Set the CE-21A to -10, -20, -30, -40 dBm. Signal should rise to +10, +20, +30, +40 dB graticule lines ±2 dB.

2.12 VERTICAL LINEARITY AT 1 dB/DIV

a. Set instruments as in para. 2.07 except set CE-26A LEVEL to -20 dBm. Set CE-21A LEVEL to -20 dBm. Set CE-23A to 30 kHz/DIV. and set SENSITIVITY to 1 dB/DIV. Set signal level to 0 dB graticule line with VERTICAL POSITION control.

b. Set the CE-26A to -22 dBm. Signal should drop to -20 dB graticule line ±0.5 division. Adjust the CE-26A from -22 dBm to -16 dBm in 1 dB steps. Signal should increase one division for each 1 dB step ±0.5 division.

2.13 MARKER ACCURACY

a. Set instrument controls as in para. 2.07 except set CE-21A LEVEL to

-30 dBm. Set CE-23A to 0.4 kHz/DIV and turn MARKER ON.

b. The marker pulse should be superimposed directly on the signal ±0.2 division.

c. Set the CE-23A to 6 kHz/DIV, 30 kHz/DIV, 300 kHz/DIV and 900 kHz/DIV. In each case the marker pulse should be superimposed on the signal ±0.2 division.

2.14 HI-LEVEL ALARM ACCURACY

a. Set instrument controls as in para. 2.07 except set CE-23A to 6 kHz/DIV, VERTICAL SENSITIVITY to 1 dB/DIV.

b. Adjust signal level to the 0 dB graticule line with the VERTICAL POSITION control. Then turn HI-LEVEL ALARM ON. ALARM light should not light.

c. Set CE-21A to -1 dB. ALARM light should come on after 3 sweeps when signal exceeds the +1 dB line by 0-1 dB. Light should go out when PUSH TO RESET button is depressed. Turn HI-LEVEL ALARM OFF.

2.15 FREQUENCY RESPONSE

a. Set instrument controls as in para. 2.07 except set CE-21A LEVEL to -20 dBm. Set CE-23A SIGNAL GEN to SWEEP, VERTICAL SENSITIVITY to 1 dB/DIV.

b. Set trace to the +10 dB line on the graticule with VERTICAL POSITION control. Signal level from 10 kHz to 9 MHz should be flat ±0.5 dB.

2.16 SIGNAL LEVEL ACCURACY IN 10 dB/DIV MODE

a. Set instrument controls as in para. 2.07 except set CE-21A LEVEL to -30 dBm. Set CE-23A SIGNAL GEN to SWEEP.

b. The signal trace should be on the +30 dB graticule line ±1 dB.

c. Place SIGNAL GEN in MANUAL position and turn SWEEP switch to the MANUAL position. Adjust spot to the signal with the MANUAL TUNE control. The CRT beam spot should go to the +30 dB graticule line ±1 dB.

d. Set CE-23A to 0.4, 6, 30 and 300 kHz DIV and repeat steps b, c.

2.17 SIGNAL LEVEL ACCURACY IN 1 dB/DIV MODE

a. Set instrument controls as in para. 2.07 except set CE-23A VERTICAL SENSITIVITY to 1 dB/DIV and set SIGNAL GEN to SWEEP.

b. Adjust the VERTICAL POSITION control to place the signal trace on the +30 dB graticule line.

c. Set SIGNAL GEN and SWEEP both to MANUAL. Adjust spot to the signal with MANUAL TUNE control. The CRT beam spot should rise to the +30 dB line ±0.5 division.

d. Repeat b. and c. for 0.4, 6, 30, 300 kHz/DIV. CRT beam spot should rise to the +30 dB line ±0.5 division for each position of the kHz/DIV switch.

2.18 SPURIOUS RESPONSES

a. Set instrument controls as in para. 2.07 except set CE-21A LEVEL to -20 dBm.

b. Set the CE-21A FREQUENCY from 4 kHz to 1 MHz and then to 9 MHz in 1 MHz steps. All spurious responses on the CRT display should be below the -15 dB graticule line.

2.19 RESIDUAL NOISE IN LOW DISTORTION MODE

a. Set instruments as in para. 2.07 except set CE-21A MODE to LOW DISTORTION and LEVEL to -20 dBm.

b. Typical noise level peaks should be below the -5 dB line on the CRT graticule.

ADJUSTMENT AND CALIBRATION

2.20 Refer to paragraphs 2.02-2.04 and 2.06 for Preliminary Instructions and Test Setup. This setup is to be used throughout the Adjustment procedure.

2.21 EQUIPMENT REQUIRED

Frequency Selective Levelmeter	CE-21A
Signal Generator	CE-26A
Frequency Counter	Dana 8020 or equivalent
Digital Multimeter	Dana 4700 or equiv.
High Voltage Probe	Dana 641 or equiv.
Oscilloscope	HP180C with 1801A, 1820C and X10 Probe

AC Voltmeter	HP400 FL or equiv.
20 dB Fixed Atten.	Texscan FP-75
DC Power Supply	HP6215A or equiv.

2.22 INSTRUMENT CONTROL SETTINGS

a. CE-21A

dB1, dB2	-0 dB
MODE	LOW NOISE
BANDWIDTH	2.3 kHz
INPUT	75Ω, UNBAL, TERM
FREQUENCY	4.500 MHz
METER	OFF (Pushbutton depressed slightly until both come out)

b. CE-26A

LEVEL	-0 dB
FINE	Set Meter to 0 dB
OUTPUT switch	ON
TUNING	EXT
FREQUENCY	4.500 MHz
OUTPUT	75Ω, UNBAL

c. CE-23A

VERTICAL	
SENSITIVITY	10 dB/DIV
CAL	MID RANGE
HI LEVEL ALARM	OFF
MARKER	OFF
HORIZONTAL	900 kHz/DIV
POSITION	MID RANGE
SWEEP	CONT
LEVEL METER	SWEEP
SIGNAL GEN	MANUAL

2.23 LOW VOLTAGE POWER SUPPLY

a. Elevate the 2700 board on the extender. Refer to para. 2.04, e. See Figure 2-1.

b. Measure the voltages and adjust if voltage is more than ±.05V from its required value. Measure +20V at pin 15, adjust R8, +12 at pin 20, adjust R11, +5V at pin 12, adjust R24 and -12V at pin 2, adjust R35. Always set +20V before adjusting +5V.

c. Replace 2700 board.

2.24 HIGH VOLTAGE POWER SUPPLY

a. Turn off power to CE-23A, remove seven screws from High Voltage board (3100) screen cover and elevate board on the extender.

b. Connect a X10 probe to the counter as an isolator and connect to collector of Q1 or Q2 (D44C8). Turn power on.

CAUTION

High voltages present on this board

c. Adjust R9 (Figure 2-1) until counter reads 14.55 kHz ±200 Hz.

d. Transfer X10 probe to oscilloscope. Display should show a square wave, +56V ±2V in amplitude.

e. Connect the high voltage probe to the multimeter and check the voltages as follows:

Pin 14	-2200V ±200V
Pin 12	Approx. 100V less negative than pin 14
Pin 10	+240V ±10V
Pin 8	+100V ±5V

f. Turn INTENSITY controll fully CCW. Trace should not be visible. If necessary adjust R11 until trace disappears. Turn INTENSITY CW. A faint trace should appear at about 1/4 to 1/3 turn. Adjust R11 until both conditions are met. Set INTENSITY for a comfortable viewing level. Replace 3100 board and screen cover.

2.25 CRT ALIGNMENT

a. Turn CE-23A on. Turn SIGNAL GEN control to SWEEP and adjust trace to one of the horizontal graticule lines. Loosen CRT neck clamp screw and turn CRT if necessary to make trace line up with graticule line.

b. Make sure CRT is positioned so that the faceplate is in contact with the graticule plate. (Lines on the graticule plate should be next to the CRT faceplate.) Turn off CE-23A. Tighten CRT clamp screw snugly, but do not overtighten.

2.26 HORIZONTAL DEFLECTION AMPLIFIER

a. Set controls as in para. 2.22 except set SWEEP to MANUAL.

b. Turn off the CE-23A and remove screws from screen cover over the 3200 board (Figure 2-1). Elevate the 3200 board. Turn on CE-23A.

c. Rotate the MANUAL TUNE control fully CCW. Adjust R15 (H. CENT), Figure 2-1, until the spot on the CRT is at the left edge of the CRT. (Steps c and d. are a coarse adjustment. May be omitted.)

d. Rotate the MANUAL TUNE control fully CW. Adjust R6 (H. GAIN) until the spot is at the right edge of the CRT.

e. Set the oscilloscope trace for 0 volts DC to the center line on the oscilloscope graticule. Connect the oscilloscope to pin 10 on the 2300 board.

f. Rotate the MANUAL TUNE control until the voltage shown on the oscilloscope is +4.5V. Adjust R15 (H. CENT) until the spot on the CE-23A CRT is on the 0.0 graticule line.

g. Rotate MANUAL TUNE until pin 10 on 2300 board is at -4.5V. Adjust R6 (H. GAIN) until the spot on the CRT is at the 10.0 cm line. Repeat steps f. and g. until no further adjustment is required.

h. Rotate MANUAL TUNE control until voltage at pin 10 on board 2300 is 0.0 volts. The spot on the CRT should be on the center (5 cm) line. Replace 3200 board.

2.27 MASTER PHASE LOCK LOOP

a. Set instrument controls as in para. 2.22 except set kHz/DIV switch to 30 kHz/DIV. Elevate the 2600 board (Figure 2-1). Connect DMM to TP2 and check the output of the VCO Regulator for +11.7V ±0.2V. Then connect the DMM to TP3 and the counter to TP1. (Figure 3-9, component identification.)

b. Set the CE-21A to 0.000 MHz (L.O. of 12.0 MHz). Counter should read 12.5 MHz ±100 Hz, and DMM should read 0.0V ±0.9V.

c. Set CE-21A in 1.0 MHz steps from 0.000-9.000 MHz and to 9.200 MHz. The VCO frequency as read on the counter should change in 1.0 MHz steps from 12.5-21.5 MHz and read 21.7 MHz for a setting of 9.200 MHz. The DMM should read 0.0V ±0.9V. Adjust R74 (steer offset) to center variations around 0.0V, and R66 (Steer Gain) for best linearity within ±0.9V.

Table 2-1. Relationship Between CE-21A and CE-23A VCO Frequencies

CE-21A Dialed Freq.	CE-21A LO Freq.	CE-23A Master VCO Freq.	CE-23A Slave VCO Freq.
1 MHz	13.0 MHz	13.5 MHz	13.0 MHz
3 MHz	15.0 MHz	15.5 MHz	15.0 MHz
5 MHz	17.0 MHz	17.5 MHz	17.0 MHz
7 MHz	19.0 MHz	19.5 MHz	19.0 MHz
9 MHz	21.0 MHz	21.5 MHz	21.0 MHz

d. If it has been necessary to install a new varactor diode at CR6, CR7, or CR8, or if circuit goes out of lock at any point (VCO a random frequency instead of being 500 kHz higher than the CE-21A L.O.) it may be necessary to readjust L9 slightly. Readjust R74, R66 and L9 until the requirements of step c. are met. Be very careful in adjusting L9 since the linearity of the frequency/voltage at TP3 may be seriously affected by this adjustment. See Table 2-1.

e. Connect the oscilloscope to TP7. Output should be a square wave from 0 to +3 volts minimum. Connect X10 scope probe to counter for isolation and check frequency at TP7. Frequency should be 500 kHz ±50Hz. If not, repeat steps c., d., e.

2.28 SLAVE PHASE LOCK LOOP

a. This procedure, para. 2.28-2.30, should only be used in case of poor Horizontal linearity or if a new varactor diode, CR7, CR8, or CR9, has been installed.

b. Set controls as in para. 2.22 except set kHz/DIV switch to 30 kHz/DIV, set SWEEP control to MANUAL and set CE-21A FREQUENCY to 0.000 MHz (L.O. out 12.0 MHz). Place a BNC Tee on the "B" connector of the CE-23A, connect the cable to the CE-21A to one end of the tee and connect the counter to the other end. Set the MANUAL tune control for a reading of 12.0 MHz on the counter.

c. Elevate the 2500 board. (Figure 2-1). Disconnect the jumper between TP10 and TP11 (Figure 3-8 component identification) and connect an external power supply to the VCO control line, TP10. Monitor the power supply voltage with the DMM.

d. Set the power supply to 0.5V. The counter should read approximately 12.0 MHz. Adjust L7 until counter reads 12.0 MHz (coarse adjustment). Set the power supply to 7.0 volts and adjust L7 until the counter reads 21.0 MHz. Set the power supply voltage for the frequencies in Table 2-2 and check that voltage for the given frequency falls within the limits given. A slight readjustment of L7 is permissable if necessary.

Table 2-2. Slave VCO Voltage/Frequency Tuning Limits

Freq. MHz	Min. V.	Med. V.	Max. V.	Freq. MHz	Min. V.	Med. V.	Max. V.
12.0	.05	.25	.80	18.0	4.35	4.80	5.35
13.0	.75	1.10	1.70	19.0	5.00	5.45	6.05
14.0	1.50	2.05	2.60	20.0	5.75	6.10	6.75
15.0	2.30	2.90	3.45	21.0	6.55	7.10	7.75
16.0	3.10	3.55	4.10	21.5	7.00	7.75	8.35
17.0	3.75	4.15	4.70				

e. Set the voltage to 6.5V and note frequency. Set voltage to 7.5V and again note frequency. The frequency difference must be greater than 0.5 MHz to ensure that linearizer can be aligned. Disconnect external power supply and reconnect TP10-TP11.

f. Connect DMM to TP8 and set CE-21A

to 4.500 MHz (L.O. 16.5 MHz) and adjust R72 (STEER OFFSET) for a DMM reading of 2.25V ±0.01V. Set CE-21A to 0.000 MHz (L.O. 12.0 MHz) and set R67 (STEER GAIN) for a reading of 0.00V ±0.01 at TP8. Set CE-21A to 9.000 MHz (L.O. 21.0 MHz) DMM should read 4.50V ±0.02V. Repeat adjustments until all conditions are met.

2.29 SUMMING AMPLIFIER ALIGNMENT

a. Set the kHz/DIV switch to 900 kHz/DIV. Connect DMM to board pin 16 and adjust MANUAL TUNE for a reading of +4.5V. Connect DMM to TP7 and adjust R97 (9 MHz) for a reading of 0.10V ±0.02V. Connect DMM to board pin 16 and adjust MANUAL TUNE control for a reading of 0.0V. Voltage at TP7 should be 2.35V ±0.02V. Connect DMM to board pin 16 and adjust MANUAL TUNE control for a reading of -4.5V. Voltage at TP7 should read +4.60V ±0.02V.

b. Set kHz/DIV switch to 300 kHz/DIV. Set CE-21A to 4.500 MHz. Set MANUAL TUNE control for a voltage of +4.5V at board pin 14. Adjust R90 (3 MHz) for a voltage of +1.60V ±0.01V at TP7. Set MANUAL TUNE for a voltage of 0.0V at board pin 14. Voltage at TP7 should read +2.35V ±0.01V. Set MANUAL TUNE for -4.5V at board pin 14. Voltage at TP7 should be 3.10V ±0.02V.

c. Set CE-21A to 3.000 MHz. Set MANUAL TUNE for a voltage of 0.0V at board pin 14. The voltage at TP7 should read +1.60V ±0.02V. Set CE-21A to 6.000 MHz. The voltage at TP7 should read +3.10V ±0.02V.

2.30 LINEARIZER CIRCUIT ALIGNMENT

a. Set instrument controls as in para. 2.22 except set SWEEP to MANUAL. Place a BNC Tee on the "B" connector of the CE-23A, connect the cable to the CE-21A to one end of the Tee and connect the counter to the other end.

b. Set the MANUAL TUNE control for a voltage of +2.6V at TP7. Adjust R121 (BIAS) for a slave VCO frequency, as read on the counter, of 17.0 MHz.

c. Set the MANUAL TUNE control for a voltage of +1.60V at TP7. Adjust R117 (G2) for a slave VCO frequency of 15.0 MHz.

d. Set MANUAL TUNE control for a voltage of +0.10V at TP7. Adjust R108 (G1) for a slave VCO frequency of 12.0 MHz.

e. Set MANUAL TUNE control for a voltage of +4.60V at TP7. Adjust R113 (G3) for a slave VCO frequency of 21.0 MHz. Replace 2500 board, restore rear connections.

2.31 VARIABLE OSCILLATOR

a. Elevate the 2400 board. Check the precision power supply voltages with DMM. TP10 should read +15V ±2%. TP11 should read +5.0V ±2%.

b. Set instrument controls as in para. 2.22 except kHz/DIV switch to 30 kHz/DIV and set SWEEP to MANUAL.

c. Set MANUAL TUNE control for 0.0V at board pin X (jack connector toward front of instrument). Connect counter to TP8 and adjust R60 (RC OSC), for a frequency of 500 kHz ±3 kHz. Set voltage at board pin X to +4.5V with MANUAL TUNE control. Adjust R58 (300 kHz) for a frequency of 650 kHz ±3 kHz. Set MANUAL TUNE control for a voltage of -4.5V at pin X. Counter should read 350 kHz ±3 kHz.

d. Place kHz/DIV switch in the 6 kHz/DIV position. Set MANUAL TUNE control for 0.0V at board pin W. Readjust R60 (RC OSC) for a frequency of 500.0 kHz ±0.5 kHz as read on counter. Set voltage at board W to +4.5V. Adjust R59 (60 kHz) for a frequency of 530.0 kHz ±0.5 kHz.

e. Place kHz/DIV switch in 0.4 kHz/DIV position. Set MANUAL TUNE control for 0.0V at board pin U. Check voltage at TP2 for 6.0V ±0.1V. Adjust L1 (LC OSC) for 500.00 kHz ±0.05 kHz. Set MANUAL TUNE control for a voltage of +4.5V at board pin U. Adjust R89 (4 kHz) for a frequency of 502.00 kHz ±0.05 kHz as read on counter. Set MANUAL control for a voltage of -4.5V at board pin U. Frequency should be 498.00 kHz ±0.05 kHz.

f. Set kHz/DIV switch to 900 kHz/DIV, set SWEEP to CONT (adjust INTENSITY so that trace is visible). Remainder of controls of instruments as in para. 2.22.

g. With the HORIZONTAL POSITION control at mid-range the signal should be at the center of the screen ±0.2 division. Make the following checks and minor adjustments:

(1) Turn HORIZONTAL POSITION control fully CCW. The signal should move at least 3.0 divisions to the left. Turn the HORIZONTAL POSITION fully CW from mid-range. The signal should move at least 3.0 divisions to the right.

(2) Set the HORIZONTAL POSITION control so that the signal is exactly at the center of the screen ±0.1 division.

(3) Place the kHz/DIV switch in the 30 kHz/DIV position. The signal should

remain in the center of the screen ±0.5 division. Readjust R60 slightly if necessary to bring within this range.

(4) Set kHz/DIV switch to 6 kHz/DIV. The signal should remain at center of screen ±0.5 divisions. Readjust R60 slightly if necessary to bring exactly to center of screen ±0.5 divisions. Check 30 kHz/DIV position to see that signal is still at center of screen ±0.5 division.

(5) Set kHz/DIV switch to 0.4 kHz/DIV. Signal should remain at center of screen ±0.5 divisions. Readjust L1 slightly (LC OSC) to bring signal to the center of the screen ±0.5 division.

2.32 80 kHz BAND PASS FILTER

a. Set instrument controls as in para. 2.22 except on the CE-21A set dB1 to -30 dBm and on the CE-23A set kHz/DIV switch to 0.4 kHz/DIV, SIGNAL GEN to SWEEP, VERTICAL SENSITIVITY to 1 dB/DIV and CAL fully CW. Adjust VERTICAL POSITION control until the ~~horizontal trace~~ is on the 0 dB line.

b. Elevate the 2200 board. Set R3 (GAIN) fully CW and adjust the ~~horizontal trace~~ to the 0 dB line with the VERTICAL POSITION control.

c. Adjust L3 until the ~~horizontal trace~~ is at the highest position on the CRT (above 0 dB line).

d. Switch to 6 kHz/DIV and adjust L8, L9, L10, L11 (lower row of inductors) until ~~horizontal trace~~ is at the highest position on the CRT screen. Repeat adjustment several times until trace is at highest level. Set trace to 0 dB line with VERTICAL control. Turn SWEEP to MANUAL. The spike trace should reach the 0 dB line. Slight readjustment of L8-11 may be necessary to make top of spike equal to the ~~horizontal trace~~ in the SWEEP position ±0.5 dB.

e. Set SIGNAL GEN to SWEEP and set kHz/DIV switch to 30 kHz/DIV. Adjust L4, L5, L6, L7 (top row of inductors) for maximum height of trace on CRT. Repeat adjustment several times until maximum height is obtained. Adjust trace to 0 dB line with VERTICAL POSITION control. Turn SIGNAL GEN to MANUAL. The top of the spike trace should reach the 0 dB line. Slight readjustment of L4-7 may be required to make top of spike equal to the ~~horizontal trace~~ in the SWEEP position, ±0.5 dB.

f. Set kHz/DIV switch to 6 kHz/DIV and adjust VERTICAL POSITION until the ~~horizontal trace~~ is on the 0 dB line. Turn the kHz/DIV switch back to 30 kHz/DIV position and adjust R23 (1.5 kHz) to bring ~~horizontal trace~~ to the 0 dB line on the CRT.

g. Set the kHz/DIV control to 300 kHz/DIV. Adjust R15 (5 kHz) control to place the ~~horizontal trace~~ on the 0 dB line. Set kHz/DIV switch to 0.4 kHz/DIV and adjust R32 (45 Hz) control to bring ~~horizontal trace~~ to 0 dB line. Set kHz/DIV switch to 900 kHz/DIV. ~~Horizontal trace~~ should remain at 0 dB ±1 division.

h. Return the kHz/DIV to 6 kHz/DIV position. Set SIGNAL GEN to MANUAL and set kHz/DIV switch to all its positions. Signal spike should not very from 0 dB line more than ±0.5 dB and lowest to highest amplitude should not be greater than 0.5 dB in any switch position.

i. Set SIGNAL GEN to SWEEP position and the kHz/DIV switch to 6 kHz/DIV. Set VERTICAL SENSITIVITY switch to 10 dB/DIV. Adjust R3238 (V. CENT) on the deflection amplifier (3200) until the ~~horizontal trace~~ is on the +40 dB line. Turn CAL control fully CCW and adjust R3 (GAIN) (2200) control CCW until ~~horizontal trace~~ is on the +20 dB line. Adjust CAL control from fully CCW to fully CW. ~~Horizontal trace~~ should move from +20 dB line to +40 dB line.

j. Set ~~horizontal trace~~ to +30 dB line with CAL control. Set kHz/DIV switch to all positions. Trace should remain at +30 dB line ±0.5 division except 900 kHz/DIV should remain within ±1.0 division. Turn SIGNAL GEN to MANUAL and check as above with the same limits.

2.33 LOG AMPLIFIER

a. Set CE-23A as in para. 2.22 except set to 6 kHz/DIV. Elevate board 2100.

b. Set CE-26A TUNING to INT, FREQUENCY to 80 kHz and LEVEL to -56 dBm. Connect CE-26A 75Ω output to the "A" (black) connector on the rear panel of the CE-23A.

c. Connect AC Voltmeter to board pin 2 and fine tune the FREQUENCY of the CE-26A for a maximum reading on the A.C. voltmeter.

d. Connect A.C. Voltmeter to pin 4 of IC2 (Figure 3-3) and adjust L9 for a maximum reading on the AC Voltmeter.

e. Reset kHz/DIV switch to 900 kHz/DIV. Connect AC Voltmeter to IC2 pin 4 and adjust the CE-26A LEVEL and FINE for a reading of 0 dB on the Voltmeter. Then connect Voltmeter to IC2 pin 7 and adjust

R24 for a reading of 30 dB ±0.1 dB below pin 4 reading.

f. Connect Voltmeter to IC2 pin 4 and adjust the CE-26A LEVEL for a reading of -40 dB on the Voltmeter. Connect Voltmeter to IC2 pin 12 and adjust R32 for a reading 30 dB above reading at pin 4.

g. Leave Voltmeter connected to IC2 pin 12. Insert a 20 dB 75Ω attenuator between CE-26A and CE-23A "A" connector and adjust CE-26A LEVEL for a reading of -40 dB on the Voltmeter. Connect Voltmeter to IC2 pin 9 and adjust R34 for a reading 30 dB above the reading at IC2 pin 12.

h. Remove 20 dB attenuator and set CE-26A LEVEL and FINE to +7 dBm. Connect the oscilloscope to IC2 pins 4, 9, 12. The waveforms should not exceed 5V P-P.

i. Set the CE-26A LEVEL to -60 dBm. Set the CE-23A trace to the 0 dB line with the CAL control. Set CE-26A to -50 dBm. CRT trace should move up 1 division ±.5 division.

j. Set CE-23A SENSITIVITY to 1 dB/DIV and adjust trace to 0 dB line with VERTICAL POSITION control. Increase the output of the CE-26A by 1 dB. Trace should move up 1 division -0.5 or +1 division. Reconnect CE-21A "A" connection on rear panel of CE-23A and reconnect CE-26A to CE-21A input.

2.34 VERTICAL AMPLIFIER

a. Set instrument controls as in para. 2.22 except set CE-23A kHz/DIV switch to 6 kHz/DIV and set SIGNAL GEN to SWEEP.

b. Set the trace to the 0 dB line with the CAL control. Set the CE-21A LEVEL to -10, -20, -30, -40 in 10 dB steps. Trace should move up one division for each step. If trace moves in increasingly larger or smaller steps adjust R25 on 3200 board according to procedure of step c. If trace moves in irregular steps repeat the alignment of the Log Amplifier (board 2100).

c. Set the CE-21A to -40 dBm. Adjust R25 (V. GAIN) (board 3200) until trace is on +40 dB line on CRT graticule. Set CE-21A to 0 dBm and adjust R38 (V. CENT) to set the trace on the 0 dB line. Repeat procedure until the trace on the CRT falls on the proper line, ±0.5 division as the CE-21A is adjusted between 0 and -40 dBm.

d. Set CE-21A to 0 dBm. Adjust trace to 0 dB line on the CRT with the CAL control. If line on knob does not line up with panel mark, loosen knob and reset to panel mark. Retighten knob.

e. With CE-21A set to 0 dBm change the CE-26A LEVEL to -40 dBm. The trace should go slightly below the -20 dB line. Adjust R22 (BOT CLIP) until trace is 0.2 division below -20 dB line.

f. Return CE-26A to 0 dBm. Change CE-23A VERTICAL SENSITIVITY to 1 dB/DIV. Turn VERTICAL POSITION control fully CW. Adjust R24 (TOP CLIP) so that trace is 0.5 division above the top graticule line.

g. Set the CE-21A LEVEL to -30 dBm. Leave CE-23A in 1 dB/DIV position. Adjust VERTICAL POSITION until trace is on the 0 dB line. Adjust the CE-21A LEVEL in 1 dB steps until trace reaches the +40 dB line. The trace should move up one division per step ±0.5 division.

2.35 HI-LEVEL ALARM

a. Set instrument controls as in para. 2.22 except set kHz/DIV switch to 300 kHz/DIV and set SIGNAL GEN to SWEEP.

b. Set trace to 0 dB line with CAL control. Turn SIGNAL GEN to MANUAL. Make certain MARKER is OFF. Turn HI-LEVEL ALARM ON. Observe HI-LEVEL ALARM light for 10 seconds. It should not come on.

c. Set CE-21A LEVEL to -1 dBm. The HI-LEVEL ALARM light should come on after three sweeps. It should be turned off by depressing the light housing button. Check in each position of the kHz/DIV switch except 900 kHz/DIV. If necessary adjust R2337 on the 2300 board.

d. Connect an ohmmeter (DMM) to the two HI-LEVEL ALARM binding posts on the rear panel. There should be a closed circuit when the HI-LEVEL ALARM light is lighted and an open circuit when it is off.

PREPARATION FOR RESHIPMENT

2.36 It is recommended that the shipping box and foam packaging be kept in case it becomes necessary to return the instrument to the factory or service point for service or repair.

2.37 The following paragraphs contain a general guide for repackaging of the instrument for shipment.

NOTE

If the instrument is to be shipped, attach a tag to the instrument identifying the owner, and indicating the service or repair to be accomplished. Include the model number and full serial number of the instrument. In correspondence, identify the instrument by model number, serial number, and part number.

2.38 If the original container is to be used, proceed as follows:

a. Place the instrument in the original container. (If the original container is not available, one can be purchased from Cushman Electronics.)

b. Ensure that the container is well sealed with strong tape or metal bands.

2.39 If the original container is not used, proceed as follows:

a. Wrap the instrument in plastic or heavy paper before placing in an inner container.

b. Place packing material around all sides of the instrument.

c. Place the instrument and inner container in a heavy carton or wood box, and seal with strong tape or metal bands.

d. Mark the shipping container: "DELICATE ELECTRONIC INSTRUMENT," "FRAGILE."

SERVICE OR REPAIR

2.40 In the event service or repair is required, contact:

Cushman Electronics, Inc.
Customer Service Department
830 Stewart Drive
Sunnyvale, California 94086
Telephone: (408) 739-6760

Repair service for Cushman Electronics equipment is available at:

BCS Associates, Inc.
940 North Fern Avenue
Orlando, Florida 32803
Telephone: (305) 896-4881

TROUBLESHOOTING

2.41 When trouble is experienced make certain that it is not caused by conditions external to the instrument. Check the following items.

a. Make sure AC power is available at the receptacle to which power cord is connected.

b. Turn SCALE illumination control fully CW. If screen is not illuminated check fuses, AC supply.

c. Make certain that all controls are in the proper position for use to be made of instrument.

d. Be sure that connections on the rear panel are properly made according to connection indicators. Black "A" to black "A", black "B" to black "B" etc.

e. Be certain that input signals to the CE-21A are plugged into the proper input jack and that BRDG/TERM and BAL/UNBAL switches are properly set.

f. Check output of Low Voltage and High Voltage power supplies according to paragraphs 2.23 and 2.24.

g. Use Table 2-3, Troubleshooting Chart and Figure 2-2, Troubleshooting Block Diagram to localize trouble.

h. If a component is replaced go through the Performance Check, paragraphs 2.05 to 2.19. If necessary recalibrate the instrument according to the Adjustment procedure, paragraphs 2.20 to 2.35.

i. More information and assistance in shooting trouble may be obtained by a call to the Cushman Electronics Customer Service Department (see paragraph 2.40).

j. If a board or the complete instrument is to be shipped for repair always contact the Cushman Electronics Customer Service Department before shipping (see paragraphs 2.36-2.40).

TABLE 2-3. TROUBLESHOOTING CHART

INDICATION	POSSIBLE CAUSE	CHECK
No trace on CRT	Intensity control not turned far enough CW.	Turn Intensity control CW until trace appears.
	LEVELMETER switch in MANUAL position.	Turn switch to SWEEP position.
	SWEEP switch in SINGLE or MANUAL position.	Turn switch to CONT position.
	No High Voltage	Check High Voltage Supply Board 3100.
	Blanking amplifier not unblanked.	Check blanking amplifier on Board 3200.
	Defective CRT.	Replace CRT.
Stationary spot on one side of CRT, Right or Left	Horizontal Deflection	Check horizontal deflection amplifier on Board 3200 for output.
	Sweep Generator	Check Ramp Generator Board 2300.
	Variable Oscillator, Slave or Master Phase Lock loop	Check outputs from Boards 2400, 2500, 2600 according to Figure 2-2 Troubleshooting Block Diagram.
Stationary spot on either side or any place between	SWEEP switch in MANUAL position	Turn switch to CONT position.
No vertical deflection	No 80 kHz input from CE-21A	Check for 80 kHz at "A" connector, J4002.
	80 kHz Bandpass Filter	Check for 80 kHz output from Board 2200.
	Logarithmic Amplifier	Check for 80 kHz output from 2100 Board.
	Vertical Display Amplifier	Check for output from Board 3200
	Low Voltage Power Supply	Check DC outputs from Board 2700
No Marker	Marker Oscillator Circuits	Check for 20 kHz pulse marker output from Board 2400

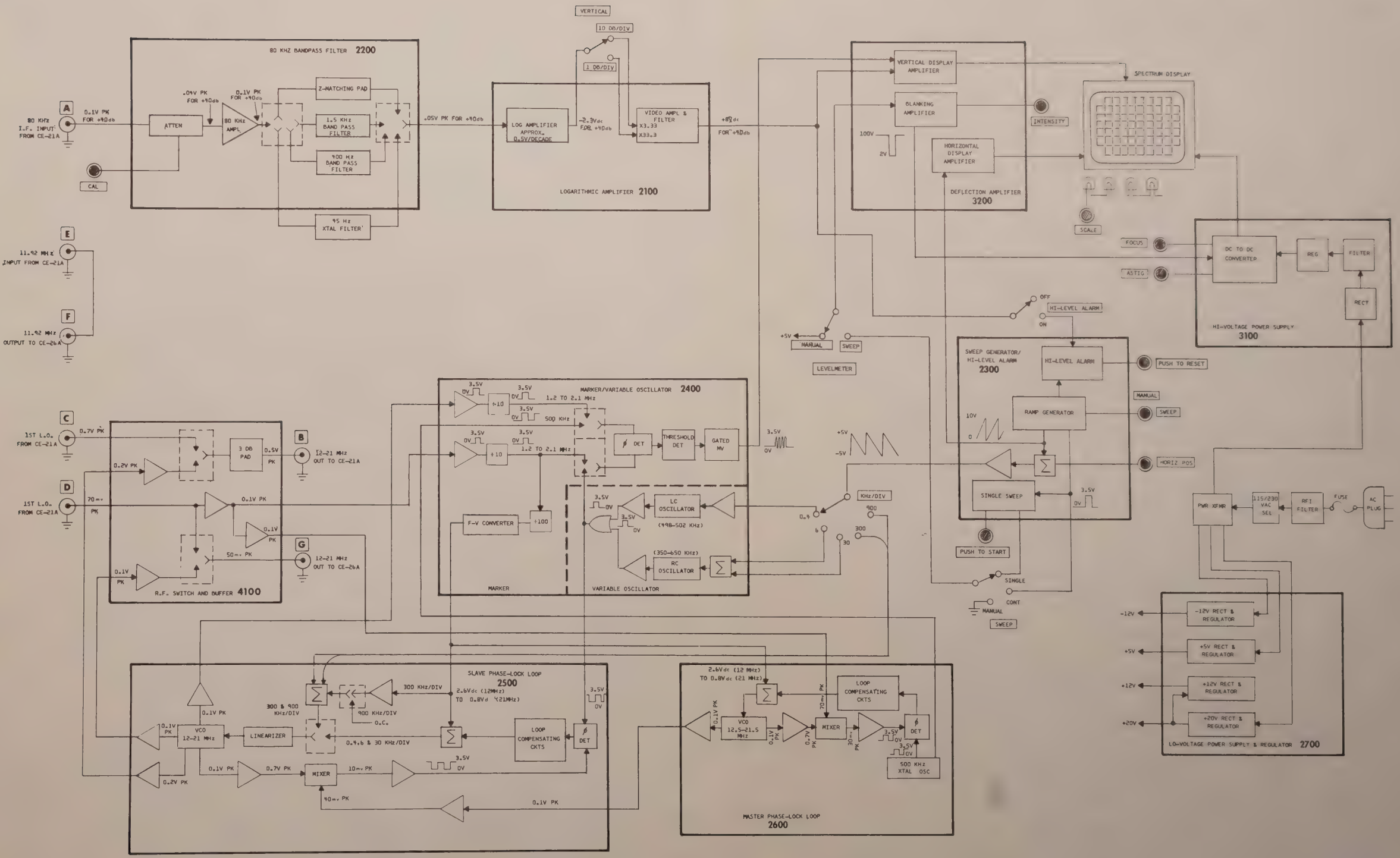

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Figure 2-2. Trouble Shooting Block Diagram

SECTION 3
PARTS LISTS AND SCHEMATIC DIAGRAMS

INTRODUCTION

3.01 The following parts lists and schematic diagrams have been arranged in order according to the Circuit Reference Series numbers. Refer to paragraph 1.03. Each schematic diagram and parts list is identified with this number. The circuit boards in the instrument are etched with an identifying Printed Circuit Board number. See Cross Reference, Table 3-1 below

3.02 Parts list pages are grouped with the schematic diagrams to which they refer. Component identification drawings showing the location of the individual components on the circuit boards are placed on the inner sheet of the schematic diagram to which they apply.

TABLE 3-1 P.C. Board/Circuit Reference Series Cross Reference

P.C. BOARD NO.	TITLE	CKT REF NO.
1780-0210	Logarithmic Amplifier	2100
1780-0217	High Voltage Power Supply	3100
1780-0406	Master Phase Lock Loop	2600
1780-0407	Marker/Variable Oscillator	2400
1780-0408	Extender Board	0000
1780-0409	Slave Phase Lock Loop	2500
1780-0410	Sweep Generator/Hi-Level Alarm	2300
1780-0411	R.F. Switch & Buffer	4100
1780-0412	80 kHz Band Pass Filter	2200
1780-0413	Deflection Amplifier	3200
1780-0414	Low Voltage Power Supply	2700

FRONT PANEL. 1000

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	Assy, Front Panel	7003-0069	Cushman	
	Front Panel	2800-0084	Cushman	
	Assy, Front Subpanel	7003-0073	Cushman	
	Front Panel	2800-0090	Cushman	
DS1	5V, 60 MA, T-1 bulb	2870-0014	Display Device	100060-683
	HOLDER			
	Holder-Lamp w/Amber lens	1965-0008	Display Device	101BWXXXTA15
	RESISTORS			
R1	Pot, 1k, ±10%, 1/2W	1203-0041	Allen-Bradley	C01G056P102U
R2	P/O S2			
R3	Pot, 10k, ±10W, 1/2W	1203-0042	Allen-Bradley	C01G056P103U
R4	Pot, 10k, ±10%, 2W	1203-0057	Allen-Bradley	70B1G048F103W
	SWITCHES			
S1	SPST w/red incadescent lens	1852-0014	Drake	7077-000-834
S2/R2	2 pos, Concentric Rotary	1851-0059	Cushman	
S3	2 pos, Rotary	1851-0060	Cushman	
S4	2 pos, Rotary	1851-0060	Cushman	
S5	SPST w/red incadescent lens	1852-0014	Drake	7077-000-834
S6	2 pos, Rotary	1851-0062	Cushman	
S7	5 pos, 8 pole, Rotary	1851-0078	Cushman	
S8	3 pos, 3 pole, Rotary	1851-0077	Cushman	

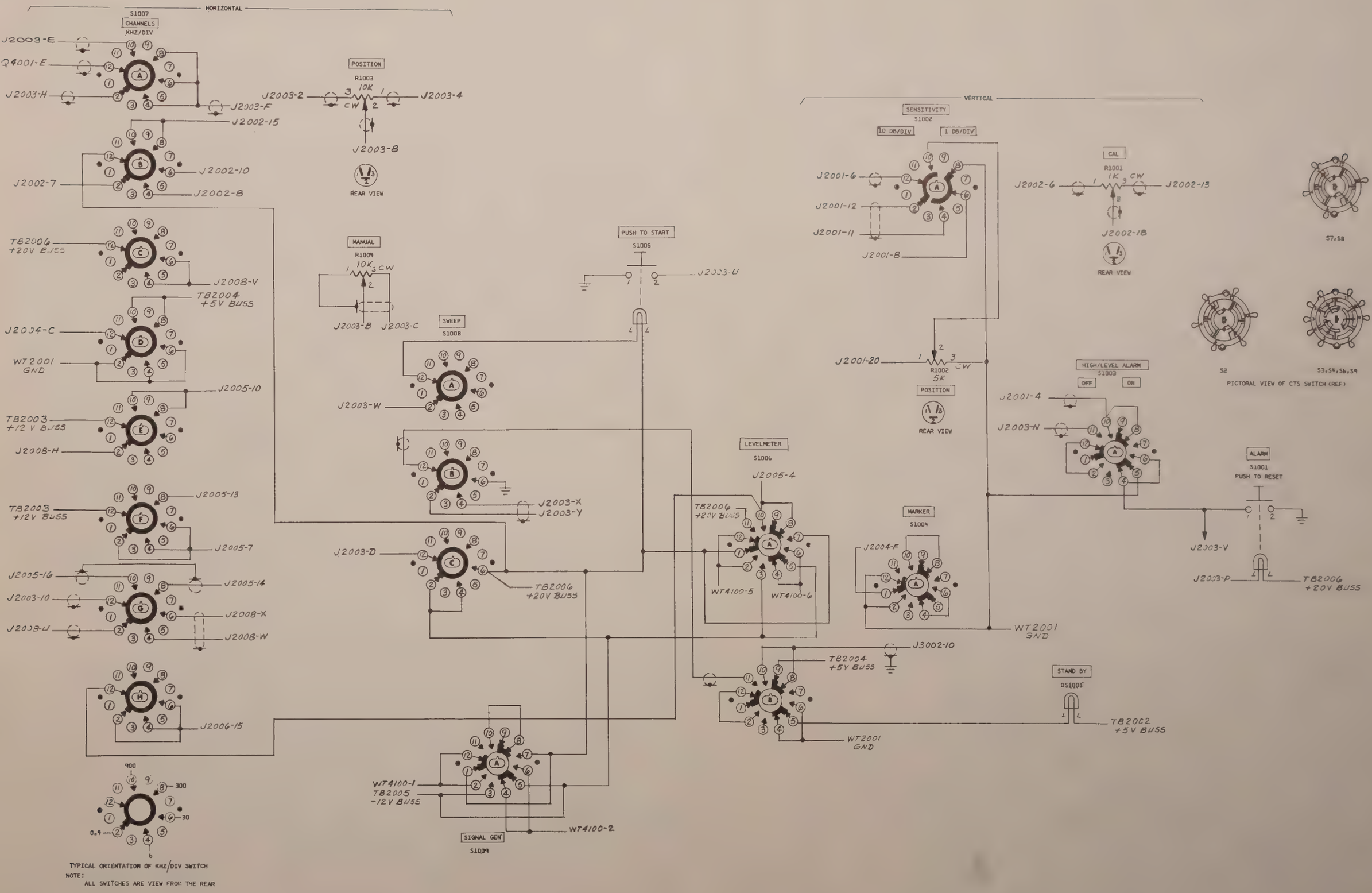

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Figure 3-1. Front Panel, Interconnection Diagram. 1000

MAIN CHASSIS. 2000

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	Assy, Main	7017-0027	Cushman	
	Assy Main Chassis	7007-0020	Cushman	
	CONNECTORS			
J1	Single row, 22 pin	2535-0018	Viking	2VK22S1-1
J2	Single row, 22 pin	2535-0018	Viking	2VK22S1-1
J3	22 Contact, 44 terminal	2535-0023	Viking	2VK22D1-1
J4	22 Contact, 44 terminal	2535-0023	Viking	2VK22D1-1
J5	Single row, 22 pin	2535-0018	Viking	2VK22S1-1
J6	Single row, 22 pin	2535-0018	Viking	2VK22S1-1
J7	Single row, 22 pin	2535-0018	Viking	2VK22S1-1
J8	22 Contact, 44 terminal	2535-0023	Viking	2VK22D1-1
	FILTER			
	Crystal, 80 kHz/45H	1040-0029	Cushman	
	LAMPS			
DS1	Lamp	2870-0002	G.E.	#47
DS2	Lamp	2870-0002	G.E.	#47
DS3	Lamp	2870-0002	G.E.	#47
DS4	Lamp	2870-0002	G.E.	#47
	MISCELLANEOUS			
	Graticule, Scope, 5"	4941-0015	Cushman	
	Tube, Cathode Ray, 5" round	1270-0020	Cushman	
	EXTENDER			
	Assy, Printed Circuit Board	7001-0222	Cushman	
	Printed Circuit Board	1780-0408	Cushman	
	CONNECTOR			
	22 Contact, 44 terminal	2535-0023	Viking	2VK22D/1-1

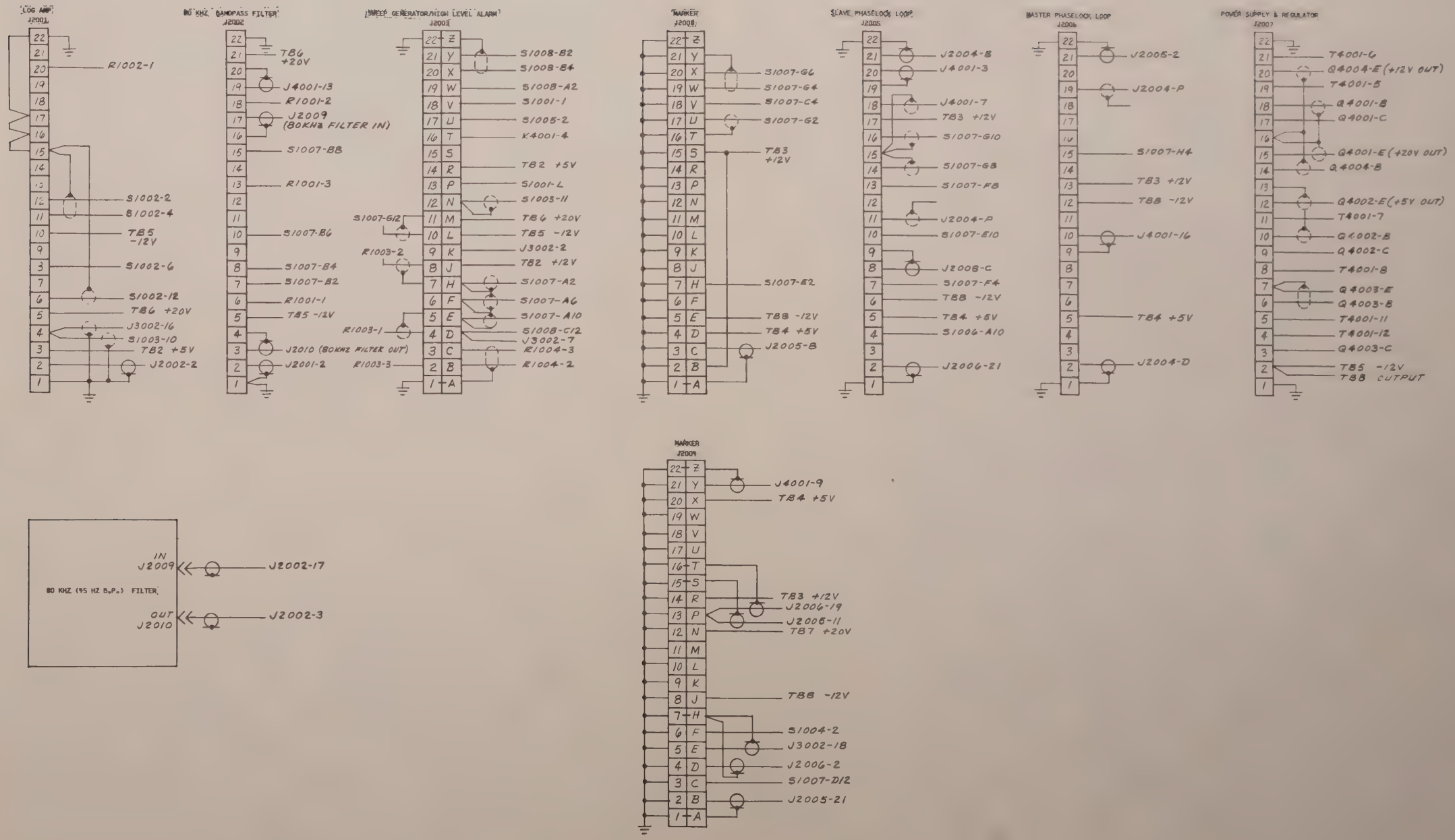

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Figure 3-2. Main Chassis, Interconnection Diagram. 2000

LOGARITHMIC AMPLIFIER, 2100

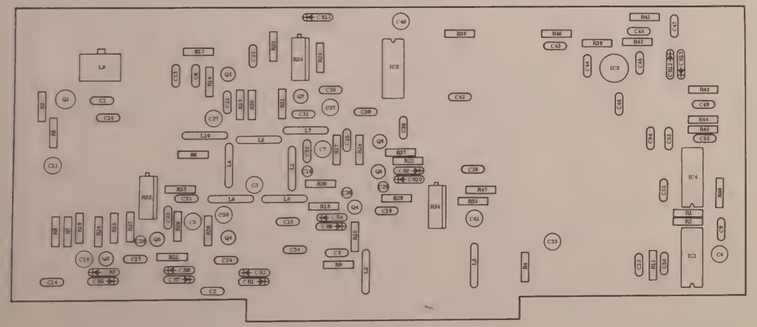
CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	Logarithmic Amplifier P.C. Board Assy	7001-0226	Cushman	
	P.C. Board	1780-0210	Cushman	
	CAPACITORS			
C1	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C2	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C3	Tant, 10μF, +50-20%, 25V	1011-0006	ITT	Tag 10/35-20
C4	Tant, 10μF, +50-20%, 25V	1011-0006	ITT	Tag 10/35-20
C5	Tant, 10μF, +50-20%, 25V	1011-0006	ITT	Tag 10/35-20
C6	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C7	Tant, 10μF, +80-20%, 25V	1011-0006	ITT	Tag 10/35-20
C8	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C9	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-V5U-103Z
C10	Mica, 3900pF, ±5%, 500V	1002-0079	Elmenco	DM19-F-392J
C11	Tant, 10μF, +50-20%, 25V	1011-0006	ITT	Tag 10/35-20
C12	Poly, .0012μF, ±10%, 100V	1008-0016	Sprague	225P12291WA3
C13	Cer. .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-V5U-103Z
C14	Poly, .1μF, ±10%, 100V	1008-0031	Sprague	225P10491WA3
C15	Poly, .1μF, ±10%, 100V	1008-0031	Sprague	225P10491WA3
C16	Tant, 10μF, +50-20%, 25V	1011-0006	ITT	Tag 10/35-20
C17	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C18	Tant, 10μF, +50-20%, 25V	1011-0006	ITT	Tag 10/35-20
C19	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C20	Tant, 10μF, +50-20%, 25V	1011-0006	ITT	Tag 10/35-20
C21	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-V5U-103Z
C22	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C23	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C24	Poly, .1μF, ±10%, 100V	1008-0031	Sprague	225P10491WA3
C25	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C26	Poly, .1μF, ±10%, 100V	1008-0031	Sprague	225P10491WA3
C27	Tant, 10μF, +50-20%, 25V	1011-0006	ITT	Tag 10/35-20
C28	Tant, 10μF, +50-20%, 25V	1011-0006	ITT	Tag 10/35-20
C29	Tant, 10μF, +50-20%, 25V	1011-0006	ITT	Tag 10/35-20
C30	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C31	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-V5U-103Z
C32	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C33	Tant, 10μF, +50-20%, 25V	1011-0006	ITT	Tag 10/35-20
C34	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C35	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C36	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C37	Tant, 10μF, +50-20%, 25V	1011-0006	ITT	Tag 10/35-20
C38	Tant, 10μF, +50-20%, 25V	1011-0006	ITT	Tag 10/35-20
C39	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C40	Tant, 10μF, +50-20%, 25V	1011-0006	ITT	Tag 10/35-20
C41	Tant, 10μF, +50-20%, 25V	1011-0006	ITT	Tag 10/35-20
C42	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C43	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C44	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C45	Mica, 150pF, ±5%, 500 V	1002-0021	Elmenco	DM15-F-151J
C46	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C47	Cer, Tub, 3.3pF, ±.25pF, 500V	1005-0011	Erie	301-000-C0J0-339C
C48	Mica, 33pF, ±5%, 500V	1002-0024	Elmenco	DM15-E-330J
C49	Poly, .027μF, ±10%, 100V	1008-0032	Sprague	225P27391
C50	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z

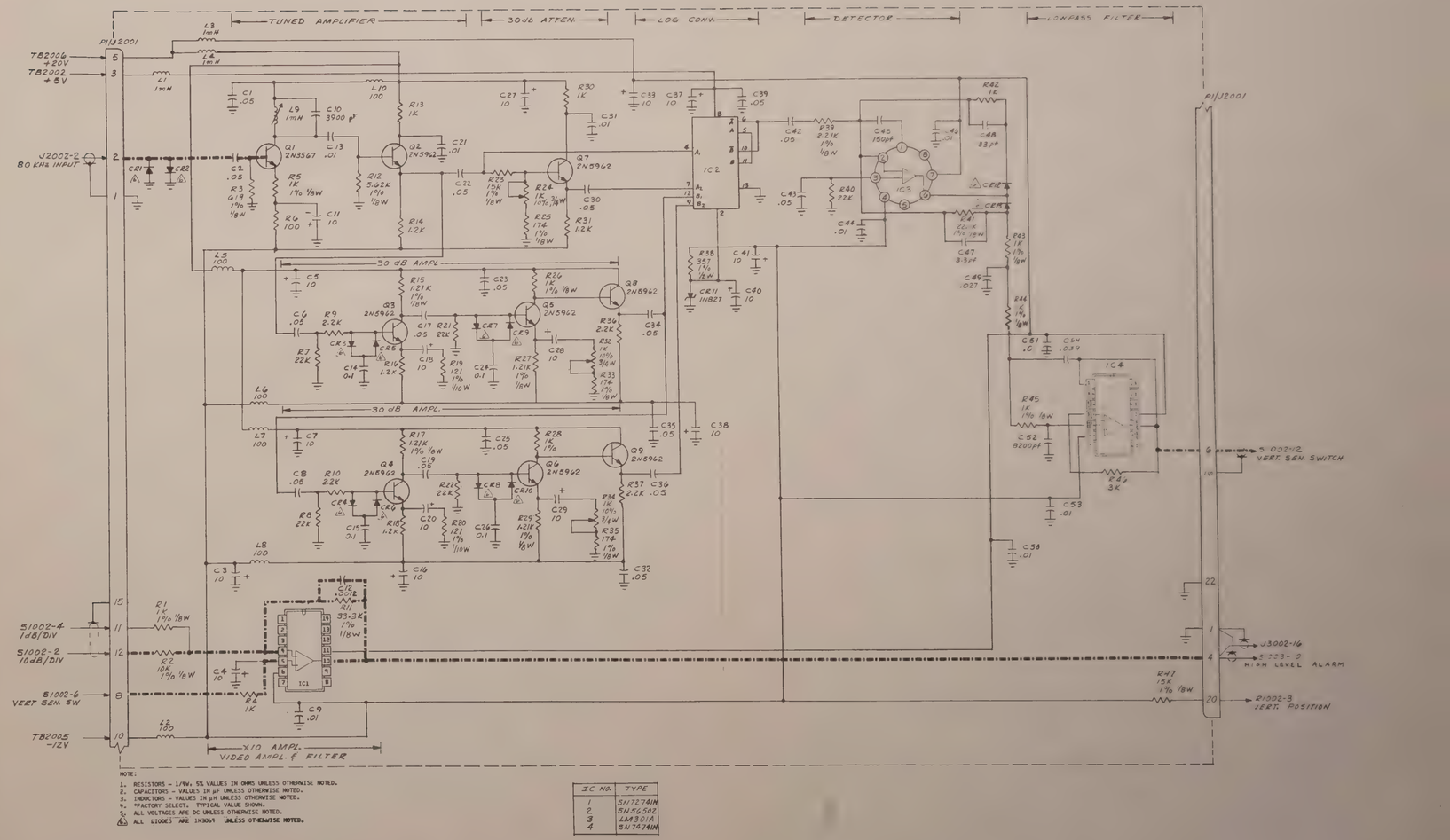
LOGARITHMIC AMPLIFIER (cont). 2100

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
C51	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C52	Mica, 8200pF, ±5%, 500 V	1002-0076	Elmenco	DM19-822J
C53	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C54	Poly, .039μF, ±10%, 100V	1008-0045	Sprague	225P39391WA3
	COILS			
L1	RF Choke, 1000μH, ±5%	1585-0020	Delevan	2500-28
L2	RF Choke, 100μH, ±5%	1585-0017	Delevan	1537-76
L3	RF Choke, 1000μH, ±5%	1585-0020	Delevan	2500-28
L4	RF Choke, 1000μH, ±5%	1585-0020	Delevan	2500-28
L5	RF Choke, 100μH, ±5%	1585-0017	Delevan	1537-76
L6	RF Choke, 100μH, ±5%	1585-0017	Delevan	1537-76
L7	RF Choke, 100μH, ±5%	1585-0017	Delevan	1537-76
L8	RF Choke, 100μH, ±5%	1585-0017	Delevan	1537-76
L9	Var, 1000μH	1596-0047	Cushman	
L10	RF Choke, 100μH, ±5%	1585-0017	Delevan	1537-76
	DIODES			
CR1	Si, DO-7 pkg. 1N3064	1281-0013	Teledyne	1N3064
CR2	Si, DO-7 pkg. 1N3064	1281-0013	Teledyne	1N3064
CR3	Si, DO-7 pkg. 1N3064	1281-0013	Teledyne	1N3064
CR4	Si, DO-7 pkg. 1N3064	1281-0013	Teledyne	1N3064
CR5	Si, DO-7 pkg. 1N3064	1281-0013	Teledyne	1N3064
CR6	Si, DO-7 pkg. 1N3064	1281-0013	Teledyne	1N3064
CR7	Si, DO-7 pkg. 1N3064	1281-0013	Teledyne	1N3064
CR8	Si, DO-7 pkg. 1N3064	1281-0013	Teledyne	1N3064
CR9	Si, DO-7 pkg. 1N3064	1281-0013	Teledyne	1N3064
CR10	Si, DO-7 pkg. 1N3064	1281-0013	Teledyne	1N3064
CR11	Zener, 6.2V, 1N827	1281-0038	Transitron	1N827
CR12	Si, DO-7 pkg. 1N3064	1281-0013	Teledyne	1N3064
CR13	Si, DO-7 pkg 1N3064	1281-0013	Teledyne	1N3064
	INTEGRATED CIRCUITS			
IC1	High Performance Op-Ampl.	2025-0022	T.I.	SN72741N
IC2	Logarithmic Ampl.	2025-0049	T.I.	SN56502N
IC3	Op-Ampl, LM301A	2025-0032	National	LM301A
IC4	High Performance Op-Ampl.	2025-0022	T.I.	SN72741N
	RESISTORS			
R1	Metal Film, 1k, ±1%, 1/8W	1075-0037	Dale	MFF 1/8 T1
R2	Metal Film, 10k, ±1%, 1/8W	1075-0009	Dale	MFF 1/8 T1
R3	Metal Film, 619Ω, ±1%, 1/8W	1075-0063	Dale	MFF 1/8 T1
R4	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R5	Metal Film, 1k, ±1%, 1/8W	1075-0037	Dale	MFF 1/8 T1
R6	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R7	Comp, 22k, ±5%, 1/4W	1066-2235	Allen-Bradley	CB2235
R8	Comp, 22k, ±5%, 1/4W	1066-2235	Allen-Bradley	CB2235
R9	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R10	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R11	Metal Film, 33.3k, ±1%, 1/8W	1075-0072	Dale	MFF 1/8 T1
R12	Metal Film, 5.62k, ±1%, 1/8W	1075-0013	Dale	MFF 1/8 T1
R13	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R14	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
R15	Metal Film, 1.2k, ±1%, 1/8W	1075-0042	Dale	MFF 1/8 T1

LOGARITHMIC AMPLIFIER (cont). 2100

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R16	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
R17	Metal Film, 1.21k, ±1%, 1/8W	1075-0042	Dale	MFF 1/8 T1
R18	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
R19	Metal Film, 121Ω, ±1%, 1/10W	1075-0006	Dale	MFF 1/10 T1
R20	Metal Film, 121Ω, ±1%, 1/10W	1075-0006	Dale	MFF 1/10 T1
R21	Comp, 22k, ±5%, 1/4W	1066-2235	Allen-Bradley	CB2235
R22	Comp, 22k, ±5%, 1/4W	1066-2235	Allen-Bradley	CB2235
R23	Metal Film, 15k, ±1%, 1/8W	1075-0081	Dale	MFF 1/8 T1
R24	Pot, 1k, ±10%, 3/4W	1215-0013	Helitrim	89WR
R25	Metal Film, 174Ω, ±1%, 1/8W	1075-0036	Dale	MFF 1/8 T1
R26	Metal Film, 1k, ±1%, 1/8W	1075-0037	Dale	MFF 1/8 T1
R27	Metal Film, 1.21k, ±1%, 1/8W	1075-0042	Dale	MFF 1/8 T1
R28	Metal Film, 1k, ±1%, 1/8W	1075-0037	Dale	MFF 1/8 T1
R29	Metal Film, 1.21k, ±1%, 1.8W	1075-0042	Dale	MFF 1/8 T1
R30	Comp. 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R31	Comp, 1.2k, ±5%, 1.4W	1066-1225	Allen-Bradley	CB1225
R32	Pot, 1k, ±10%, 3/4W	1215-0013	Helitrim	89WR
R33	Metal Film, 174Ω, ±1%, 1/8W	1075-0036	Dale	MFF 1/8 T1
R34	Pot, 1k, ±10%, 3/4W	1215-0013	Helitrim	89WR
R35	Metal Film, 174Ω, ±1%, 1/8W	1075-0036	Dale	MFF 1/8 T1
R36	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R37	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R38	Metal Film, 357Ω, ±1%, 1/2W	1076-0012	Dale	MFF 1/2 T1
R39	Metal Film, 2.21k, ±1%, 1/8W	1075-0010	Dale	MFF 1/8 T1
R40	Comp, 22k, ±5%, 1/4W	1066-2235	Allen-Bradley	CB2235
R41	Metal Film, 22.1k, ±1%, 1/8W	1075-0012	Dale	MFF 1/8 T1
R42	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R43	Metal Film, 1k, ±1%, 1/8W	1075-0037	Dale	MFF 1/8 T1
R44	Metal Film, 1k, ±1%, 1/8W	1075-0037	Dale	MFF 1/8 T1
R45	Metal Film, 1k, ±1%, 1/8W	1075-0037	Dale	MFF 1/8 T1
R46	Comp, 3k, ±5%, 1/4W	1066-3025	Allen-Bradley	CB3025
R47	Metal Film, 15k, ±1%, 1/8W	1075-0081	Dale	MFF 1/8 T1
	TRANSISTORS			
Q1	Si, NPN, 2N3567	1272-0014	Fairchild	2N3567
Q2	Si, NPN, 2N5962	1272-0059	Fairchild	2N5962
Q3	Si, NPN, 2N5962	1272-0059	Fairchild	2N5962
Q4	Si, NPN, 2N5962	1272-0059	Fairchild	2N5962
Q5	Si, NPN, 2N5962	1272-0059	Fairchild	2N5962
Q6	Si, NPN, 2N5962	1272-0059	Fairchild	2N5962
Q7	Si, NPN, 2N5962	1272-0059	Fairchild	2N5962
Q8	Si, NPN, 2N5962	1272-0059	Fairchild	2N5962
Q9	Si, NPN, 2N5962	1272-0059	Fairchild	2N5962





NOTE:

1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.
6. ALL DIODES ARE 1N3064 UNLESS OTHERWISE NOTED.

IC NO.	TYPE
1	SN72741N
2	SN5650Z
3	LM301A
4	SN7474IN

5601**0047

Figure 3-3. Logarithmic Amplifier. 2100

80 kHz BAND PASS FILTER. 2200

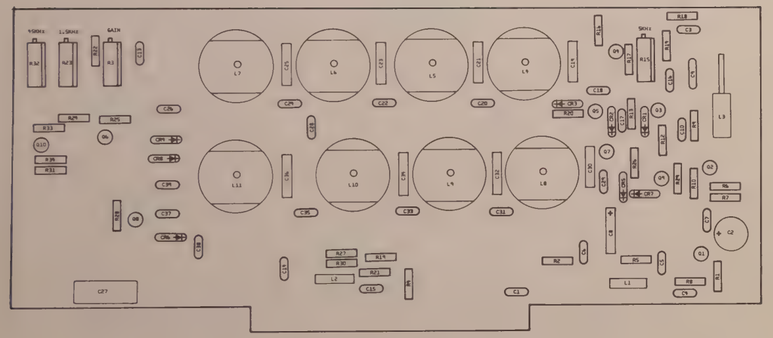
CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	80 KHz Band Pass Filter P.C. Board Assy	7001-0198	Cushman	
	P.C. Board	1780-0412	Cushman	
	CAPACITORS			
C1	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C2	Tant, 10μF, ±20%, 50V	1011-0011	Kemet	T368C106M050AS
C3	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C4	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C5	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C6	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C7	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C8	Elect, 1.5μF, ±10%, 35V	1013-0001	Sprague	150D155X9035B2
C9	Mica, 10,000pF, ±5%, 500V	1002-0086	Elmenco	DM30-103J
C10	Mica, 6200pF, ±5%, 500V	1002-0085	Elmenco	DM 9-622J
C11	Not Used			
C12	Not Used			
C13	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C14	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C15	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C16	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C17	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C18	Mica, 680pF, ±5%, 300 V	1002-0022	Elmenco	DM15-F-681J
C19	Polystyrene, 4850pF, ±1%, 100V	1008-0073	IMB	PA1B4851F
C20	Mica, 150pF, ±5%, 500V	1002-0021	Elmenco	DM15-F-151J
C21	Polystyrene, 5420pF, ±1%, 100V	1008-0077	IMB	PA1B5421F
C22	Mica, 96pF, ±1%, 500V	1002-0049	Elmenco	DM15-F-960F
C23	Polystyrene, 5490pF, ±1%, 100V	1008-0078	IMB	PA5491F
C24	Mica, 68pF, ±1%, 500V	1002-0084	Elmenco	DM15-E-580-F-0-4CR
C25	Polystyrene, 5060pF, ±1%, 100V	1008-0074	IMB	PA1B5061F
C26	Mica, 560pF, ±5%, 300V	1002-0037	Elmenco	DM15-F-561J
C27	Polycarbonate, .68μF, ±10%, 100V	1008-0039	Electrocube	625B1B684K
C28	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C29	Mica, 390pF, ±5%, 500V	1002-0033	Elmenco	DM15-F-391J
C30	Polystyrene, 5220pF, ±1%, 100V	1008-0075	IMB	PA1B5221F
C31	Mica, 36pF, ±5%, 500V	1002-0041	Elmenco	DM15-E-360J
C32	Polystyrene, 5590pF, ±1%, 100V	1008-0079	IMB	PA1B5591F
C33	Mica, 27pF, ±5%, 500V	1002-0008	Elmenco	DM15-E-270J
C34	Polystyrene, 5610pF, ±1%, 100V	1008-0080	IMB	PA1B5611F
C35	Mica, 18pF, ±5%, 500V	1002-0014	Elmenco	PA1B5361F
C36	Polystyrene, 5360pF, ±1%, 100V	1008-0076	IMB	PA1B5361F
C37	Mica, 270pF, ±5%, 500V	1002-0031	Elmenco	DM15-F-271J
C38	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C39	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-
	COILS			
L1	Choke, 100μH, ±5%, molded	1585-0017	Delevan	1537-76
L2	Choke, 100μH, ±5%, molded	1585-0017	Delevan	1537-76
L3	Var, .57-1.25mH, molded	1596-0033	Delevan	4000-42
L4	Core, Pot, Var, .7mH, ±5%	1596-0065	Cushman	
L5	Core, Pot, Var, .7mH, ±5%	1596-0065	Cushman	
L6	Core, Pot, Var, .7mH, ±5%	1596-0065	Cushman	
L7	Core, Pot, Var, .7mH, ±5%	1596-0065	Cushman	
L8	Core, Pot, Var, .7mH, ±5%	1596-0065	Cushman	
L9	Core, Pot, Var, .7mH, ±5%	1596-0065	Cushman	
L10	Core, Pot, Var, .7mH, ±5%	1596-0065	Cushman	
L11	Core, Pot, Var, .7mH, ±5%	1596-0065	Cushman	

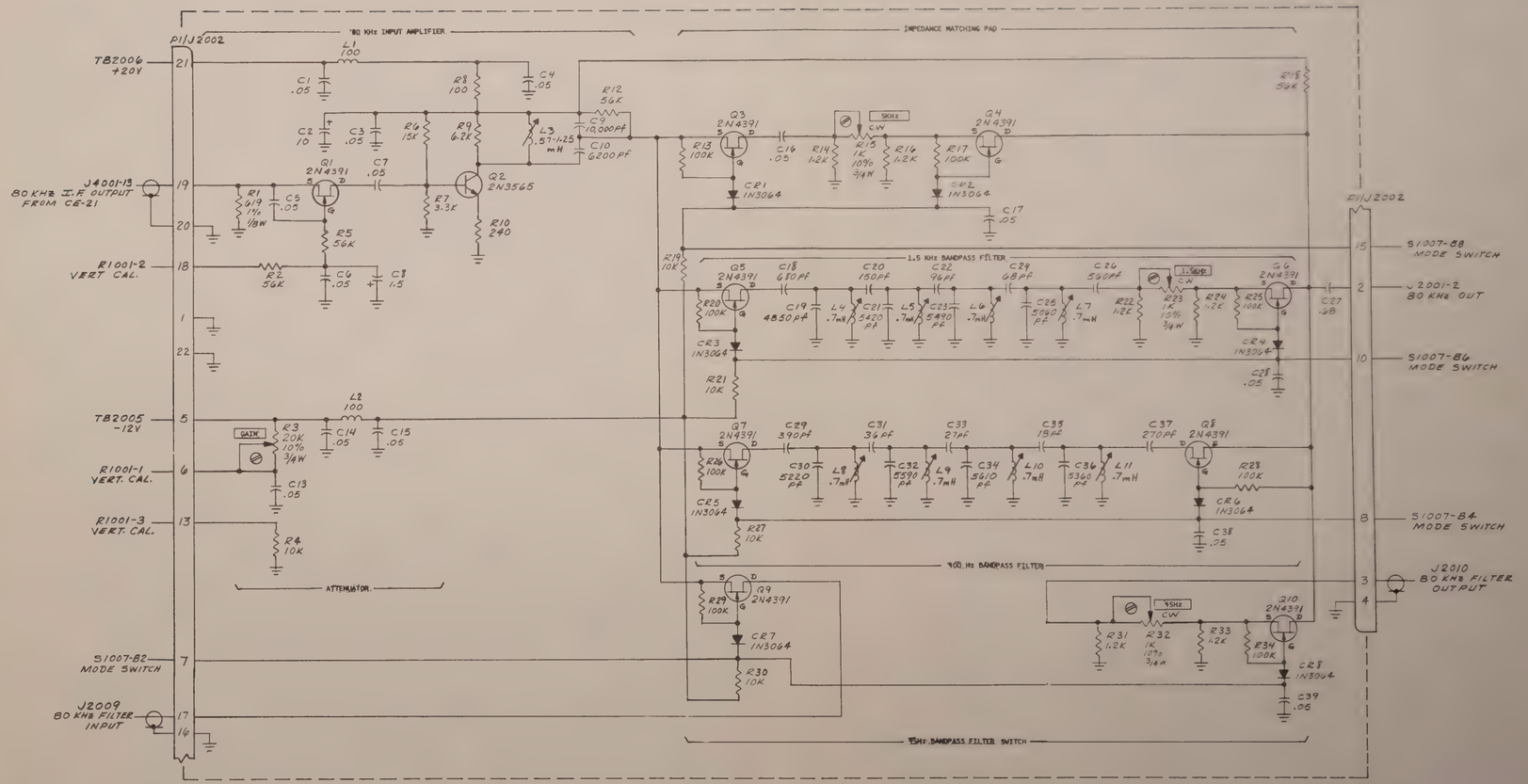
80 kHz BAND PASS FILTER (cont). 2200

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	DIODES			
CR1	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR2	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR3	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR4	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR5	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR6	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR7	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR8	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
	RESISTORS			
R1	Metal Film, 619Ω, ±1%, 1/8W	1075-0063	Dale	MFF 1/8 T1
R2	Comp, 56k, ±5%, 1/4W	1066-5635	Allen-Bradley	CB5635
R3	Pot, 20k, ±10%, 3/4W	1215-0021	Beckman	89WR
R4	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R5	Comp, 56k, ±5%, 1/4W	1066-5635	Allen-Bradley	CB5635
R6	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R7	Comp, 3.3k, ±5%, 1/4W	1066-3325	Allen-Bradley	CB3325
R8	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R9	Comp, 6.2k, ±5%, 1/4W	1066-6225	Allen-Bradley	CB6225
R10	Comp, 240Ω, ±5%, 1/4W	1066-2415	Allen-Bradley	CB2415
R11	Not Used			
R12	Comp, 56k, ±5%, 1/4W	1066-5635	Allen-Bradley	CB5635
R13	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R14	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
R15	Pot, 1k, ±10%, 3/4W	1215-0013	Helitrim	89WR
R16	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
R17	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R18	Comp, 56k, ±5%, 1/4W	1066-5635	Allen-Bradley	CB5635
R19	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R20	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R21	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R22	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
R23	Pot, 1k, ±10%, 3/4W	1215-0013	Helitrim	89WR
R24	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
R25	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R26	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R27	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R28	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R29	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R30	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R31	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
R32	Pot, 1k, ±10%, 3/4W	1215-0013	Helitrim	89WR
R33	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
R34	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
	TRANSISTORS			
Q1	FET, N-Channel, 2N4391	1272-0042	Teledyne	2N4391
Q2	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q3	FET, N-Channel, 2N4391	1272-0042	Teledyne	2N4391
Q4	FET, N-Channel, 2N4391	1272-0042	Teledyne	2N4391
Q5	FET, N-Channel, 2N4391	1272-0042	Teledyne	2N4391

80 kHz BAND PASS FILTER (cont). 2200

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
Q6	FET, N-Channel, 2N4391	1272-0042	Teledyne	2N4391
Q7	FET, N-Channel, 2N4391	1272-0042	Teledyne	2N4391
Q8	FET, N-Channel, 2N4391	1272-0042	Teledyne	2N4391
Q9	FET, N-Channel, 2N4391	1272-0042	Teledyne	2N4391
Q10	FET, N-Channel, 2N4391	1272-0042	Teledyne	2N4391





NOTE:
1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN µF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN µH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

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Figure 3-4. 80 kHz Band Pass Filter. 2200

SWEEP GENERATOR/HI-LEVEL ALARM. 2300

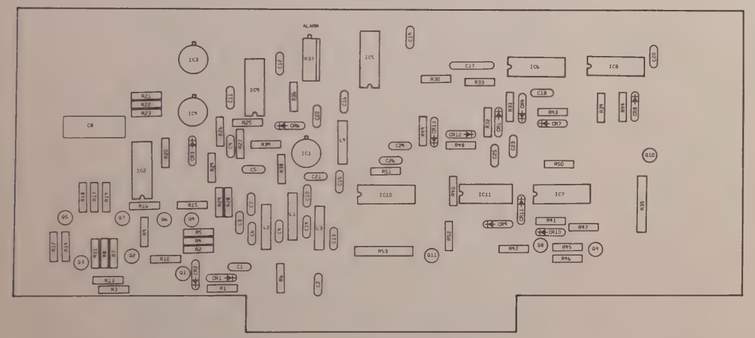
CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	Sweep Generator/High-Level Alarm P.C. Board, Assembly	7001-0200	Cushman	
	P.C. Board	1780-0410	Cushman	
	CAPACITORS			
C1	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C2	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C3	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C4	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C5	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C6	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C7	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C8	Mylar, 2μF, ±10%, 100V	1008-0063	Elpac	ZA-100V
C9	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C10	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C11	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C12	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C13	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C14	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C15	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C16	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C17	Poly, .1μF, ±10%, 100V	1008-0031	Sprague	225P10491WA3
C18	Mica, 470pF, ±5%, 500V	1002-0035	Elmenco	DM15-F-471J
C19	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C20	Mica, 470pF, ±5%, 500V	1002-0035	Elmenco	DM15-F-471J
C21	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C22	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C23	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C24	Mica, 470pF, ±5%, 500V	1002-0035	Elmenco	DM15-F-471J
C25	Mica, 100pF, ±5%, 500V	1002-0011	Elmenco	DM15-F-101J
C26	Mica, 470pF, ±5%, 500V	1002-0035	Elmenco	DM15-F-471J
	COILS			
L1	Choke, 100μH, ±5%, Molded	1585-0017	Delevan	1537-76
L2	Choke, 100μH, ±5%, Molded	1585-0017	Delevan	1537-76
L3	Choke, 100μH, ±5%, Molded	1585-0017	Delevan	1537-76
L4	Choke, 100μH, ±5%, Molded	1585-0017	Delevan	1537-76
	DIODES			
CR1	1N3064, DO-7 pkg.	1281-0013	Teledyne	1N3064
CR2	1N3064, DO-7 pkg.	1281-0013	Teledyne	1N3064
CR3	Zener, 7.5V, ±5%, 1W	1281-0026	T.I.	1N4737A
CR4	G633	1282-0005	I.T.T.	G633
CR5	G633	1282-0005	I.T.T.	G633
CR6	Zener, 9.1V, ±5%, 1W	1281-0027	IRC	1N4739A
CR7	G633	1282-0005	I.T.T.	G633
CR8	G633	1282-0005	I.T.T.	G633
CR9	1N3064, DO-7 pkg.	1281-0013	Teledyne	1N3064
CR10	1N3064, DO-7 pkg.	1281-0013	Teledyne	1N3064
CR11	1N3064, DO-7 pkg.	1281-0013	Teledyne	1N3064
CR12	G633	1282-0005	I.T.T.	G633
CR13	G633	1282-0005	I.T.T.	G633

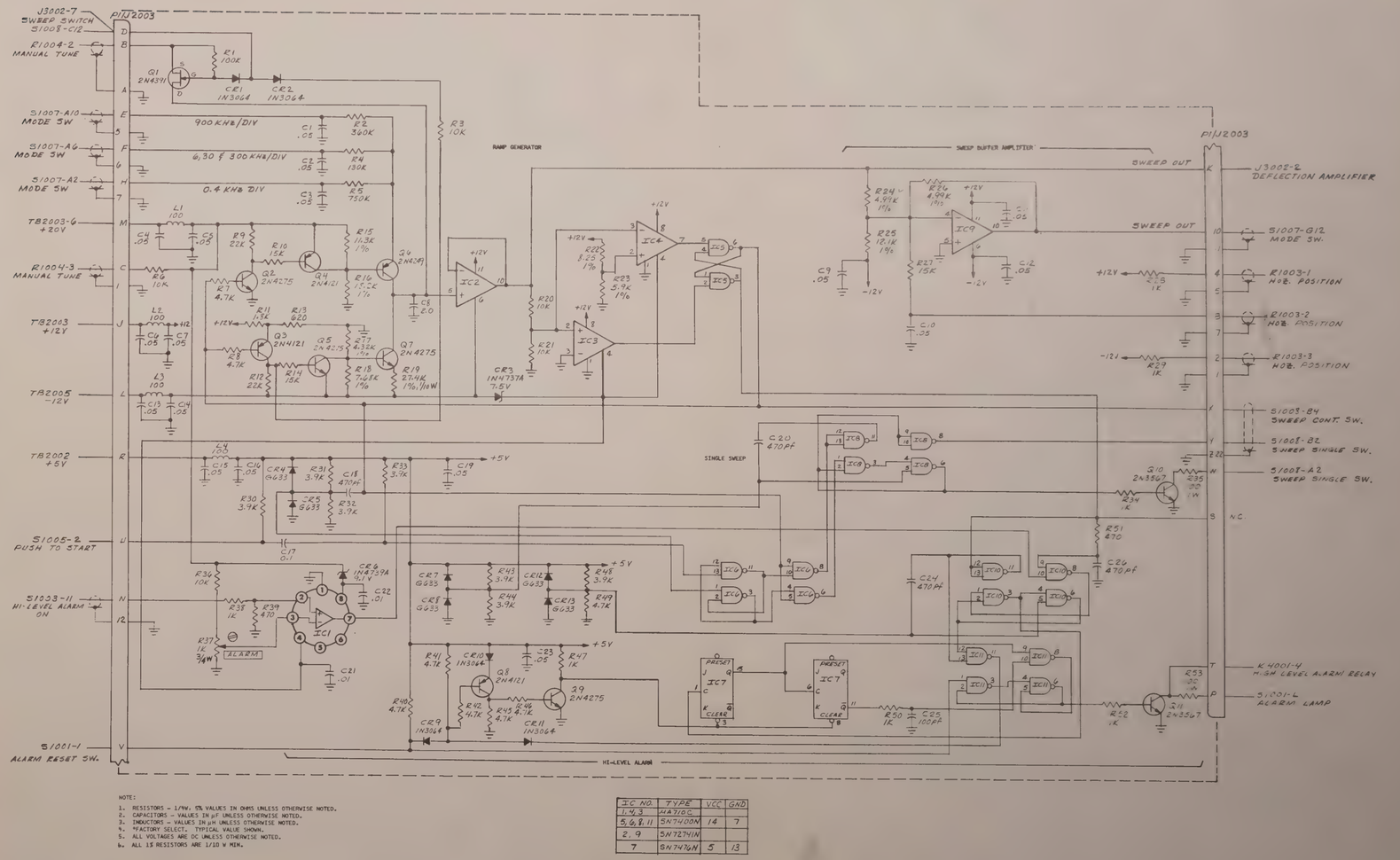
SWEEP GENERATOR/HI-LEVEL ALARM (cont). 2300

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	INTEGRATED CIRCUITS			
IC1	Differential Comparator, High Speed	2025-0028	Fairchild	UA710C
IC2	Op. Amp, High Performance	2025-0022	T.I.	SN72741N
IC3	Differential Comparator, High Speed	2025-0028	Fairchild	UA710C
IC4	Differential Comparator, High Speed	2025-0028	Fairchild	UA710C
IC5	TTL Nand Gate, SN7400N	2025-0003	T.I.	SN7400N
IC6	TTL Nand Gate, SN7400N	2025-0003	T.I.	SN7400N
IC7	TTL Dual Flip-Flop	2025-0005	T.I.	SN7476N
IC8	TLL Nand Gate, SN7400N	2025-0003	T.I.	SN7400N
IC9	Op. Amp, High Performance	2025-0022	T.I.	SN72741N
IC10	TTL Nand Gate, SN7400N	2025-0003	T.I.	SN7400N
IC11	TLL Nand Gate, SN7400N	2025-0003	T.I.	SN7400N
	RESISTORS			
R1	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R2	Comp, 360k, ±5%, 1/4W	1066-3645	Allen-Bradley	CB3645
R3	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R4	Comp, 130k, ±5%, 1/4W	1066-1345	Allen-Bradley	CB1345
R5	Comp, 750k, ±5%, 1/4W	1066-7545	Allen-Bradley	CB7545
R6	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R7	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R8	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R9	Comp, 22k, ±5%, 1/4W	1066-2235	Allen-Bradley	CB2235
R10	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R11	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R12	Comp, 22k, ±5%, 1/4W	1066-2235	Allen-Bradley	CB2235
R13	Comp, 620Ω, ±5%, 1/4W	1066-6215	Allen-Bradley	CB6215
R14	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R15	Metal Film, 11.3k, ±1%, 1/8W	1075-0034	Dale	MFF-1/8-T1
R16	Metal Film, 18.2k, ±1%, 1.8W	1075-0075	Dale	MFF-1/8-T1
R17	Metal Film, 4.32k, ±1%, 1/8W	1075-0111	Dale	MFF-1/8-T1
R18	Metal Film, 7.68k, ±1%, 1/8W	1075-0054	Dale	MFF-1/8-T1
R19	Metal Film, 27.4k, ±1%, 1/10W	1074-1004	Dale	MFF-1/10-T1
R20	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R21	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R22	Metal Film, 8.25k, ±1%, 1/8W	1075-0014	Dale	MFF-1/8-T1
R23	Metal Film, 5.9k, ±1%, 1/8W	1075-0110	Dale	MFF-1/8-T1
R24	Metal Film, 4.99k, ±1%, 1/8W	1075-0095	Dale	MFF-1/8-T1
R25	Metal Film, 12.1k, ±1%, 1/8W	1075-0011	Dale	MFF-1/8-T1
R26	Metal Film, 4.99k, ±1%, 1/8W	1075-0095	Dale	MFF-1/8-T1
R27	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R28	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R29	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R30	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R31	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R32	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R33	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R34	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R35	Comp, 100Ω, ±5%, 1W	1068-1015	Allen-Bradley	CB1015
R36	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R37	Pot, 1k, ±10%, 3/4W	1215-0013	Helitrim	89WR
R38	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R39	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R40	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725

SWEEP GENERATOR/HI-LEVEL ALARM (cont). 2300

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R41	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R42	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R43	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R44	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R45	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R46	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R47	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R48	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R49	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R50	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R51	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R52	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R53	Comp, 100Ω, ±5%, 1W	1068-1015	Allen-Bradley	CB1015
	TRANSISTORS			
Q1	FET, 2N4391	1272-0042	Teledyne	2N4391
Q2	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q3	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q4	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q5	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q6	Si, PNP, 2N4249	1272-0024	Fairchild	2N4249
Q7	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q8	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q9	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q10	Si, NPN, 2N3567	1272-0014	Fairchild	2N3567
Q11	Si, NPN, 2N3567	1272-0014	Fairchild	2N3567





NOTE:
1. RESISTORS – 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS – VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS – VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.
6. ALL 1% RESISTORS ARE 1/10 W MIN.

IC NO.	TYPE	VCC	GND
1,4,8	HA710C		
5,6,8,11	SN7400N	14	7
2, 9	SN7274N		
7	SN7476N	5	13

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Figure 3-5. Sweep Generator/Hi-Level Alarm. 2300

MARKER AND VARIABLE OSCILLATOR. 2400

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	Marker and Variable Osc. P.C. Board Assy	7001-0221	Cushman	
	P.C. Board	1780-0407	Cushman	
	CAPACITORS			
C1	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C2	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C3	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C4	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C5	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG 10/35-20
C6	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG 10/35-20
C7	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C8	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C9	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG 10/35-20
C10	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C11	Elect, 1.5μF, ±10%, 35V	1013-0001	Sprague	150D155X9035B2
C12	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C13	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C14	Tant, 3.3μF, ±10%, 15V	1011-0008	Kemet	K3R3C15K
C15	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C16	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C17	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C18	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C19	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C20	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C21	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG 10/35-20
C22	Cer, .05μF, +80-20%, 35V	1005-0014	Erie	5855-505-Y5U0-503Z
C23	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG 10/35-20
C24	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C25	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C26	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C27	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C28	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C29	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C30	Poly, .027μF, ±1%, 50V	1008-0064	TRW	863UW
C31	Tant, 10μF, ±20%, 50V	1011-0011	Kemet	T368C106M050AS
C32	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG 10/35-20
C33	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG 10/35-20
C34	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG 10/35-20
C35	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C36	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C37	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C38	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C39	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG 10/35-20
C40	Mica, 100pF, ±2%, 500V	1002-0050	Elmenco	DM15-F-101G
C41	Elect, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
C42	Mica, 4700pF, ±5%, 500V	1002-0070	Elmenco	DM-19F-472J
C43	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C44	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C45	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C46	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C47	Mica, 4700pF, ±5%, 500V	1002-0070	Elmenco	DM-19F-472J
C48	Mica, 4700pF, ±5%, 500V	1002-0070	Elmenco	DM-19F-472J
C49	Cer, .05%μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C50	Cer, .05%μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z

MARKER AND VARIABLE OSCILLATOR (cont). 2400

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
C51	Tant, 10μF, ±20%, 50V	1011-0011	Kemet	T368C106M050AS
C52	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C53	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG 10/35-20
C54	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG 10/35-20
C55	Cer, .05μF, +80-20%,	1005-0014	Erie	5855-505-Y5U0-503Z
C56	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C57	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C58	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C59	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C60	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C61	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C62	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C63	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C64	Mica, 180pF, ±5%, 500V	1002-0005	Elmenco	DM15-F-181J
C65	Mica, 180pF, ±5%, 500V	1002-0005	Elmenco	DM15-F-181J
C66	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG 10/35-20
C67	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C68	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C69	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C70	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C71	Tant, 10μF, ±20%, 50V	1011-0011	Kemet	T368C106M050AS
C72	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C73	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C74	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C75	Tant, 10μF, ±20%, 50V	1011-0011	Kemet	T368C106M050AS
C76	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C77	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C78	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG 10/35-20
C79	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C80	Tant, 10μF, +50-20%, 35V	1011-0006	Erie	5855-505-Y5U0-503Z
C81	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C82	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C83	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C84	Cer, 160pF, ±5%, 50V	1005-0088	Stetter-Trush	EDPU-10X10
C85	Not Used			
C86	Cer, 160pF, ±5%, 50V	1005-0088	Stetter-Trush	EDPU-10X10
C87	Elect, 25μF, +75-10%, 25V	1013-0010	Sprague	30D256G025CB5
C88	Cer, 160pF, ±5%, 50V	1005-0088	Stetter-Trush	EDPU-10X10
C89	Mica, 1000pF, ±5%, 100V	1002-0015	Elmenco	DM15-F-102J
C90	Mica, 3900pF, ±5%, 500V	1002-0079	Elmenco	DM19-F-392J
C91	Mica, 100pF, ±2%, 500V	1002-0050	Elmenco	DM15-F-101G
C92	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG 10/35-20
C93	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C94	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	TAG 10/35-20
C95	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C96	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C97	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C98	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
	COILS			
L1	Var, 180-215μH	1596-0066	Cushman	

MARKER AND VARIABLE OSCILLATOR (cont). 2400

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	DIODES			
CR1	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR2	Zener, 7.5V, ±5%, 1W	1281-0026	T.I.	1N4737A
CR3	Not Used			
CR4	Si, Lvaricap, MV1404	1281-0062	Motorola	MV1404
CR5	Si, Lvaricap, MV1404	1281-0062	Motorola	MV1404
	INTEGRATED CIRCUITS			
IC1	I.C., SN74196N	2025-0016	T.I.	SN74196N
IC2	TTL Nand Gates	2025-0003	T.I.	SN7400N
IC3	TTL Nand Gates	2025-0003	T.I.	SN7400N
IC4	Phase Detector	2025-0066	Motorola	MC4044P
IC5	TTL Nand Gates	2025-0003	T.I.	SN7400N
IC6	I.C., SN74196N	2025-0016	T.I.	SN74196N
IC7	TTL Decade Counter	2025-0002	T.I.	SN7490N
IC8	TTL Decade Counter	2025-0002	T.I.	SN7490N
IC9	High Speed Differential Comparator	2025-0028	Fairchild	UA710C
IC10	TTL Land Gates	2025-0003	T.I.	SN7400N
IC11	High Performance Op-Amp	2025-0022	T.I.	SN72741N
IC12	High Performance Op-Amp	2025-0022	T.I.	SN72741N
IC13	High Performance Op-Amp	2025-0022	T.I.	SN72741N
IC14	High Performance Op-Amp	2025-0022	T.I.	SN72741N
IC15	High Performance Op-Amp	2025-0022	T.I.	SN72741N
IC16	High Performance Op-Amp	2025-0022	T.I.	SN72741N
IC17	High Performance Op-Amp	2025-0022	T.I.	SN72741N
IC18	High Performance Op-Amp	2025-0022	T.I.	SN72741N
IC19	TTL Nand Gates	2025-0003	T.I.	SN7400N
	RESISTORS			
R1	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R2	Comp, 220Ω, ±5%, 1/4W	1066-2215	Allen-Bradley	CB2215
R3	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R4	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R5	Comp, 5.1Ω, ±5%, 1/4W	1066-0002	Allen-Bradley	CB51G5
R6	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R7	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R8	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R9	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R10	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R11	Comp, 2.7Ω, ±5%, 1/4W	1066-0007	Allen-Bradley	CB27G5
R12	Comp, 5.1Ω, ±5%, 1/4W	1066-0002	Allen-Bradley	CB51G5
R13	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R14	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R15	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R16	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R17	Comp, 510Ω, ±5%, 1/4W	1066-5115	Allen-Bradley	CB5115
R18	Comp, 510Ω, ±5%, 1/4W	1066-5115	Allen-Bradley	CB5115
R19	Comp, 510Ω, ±5%, 1/4W	1066-5115	Allen-Bradley	CB5115
R20	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R21	Comp, 5.1Ω, ±5%, 1/4W	1066-0002	Allen-Bradley	CB51G5
R22	Comp, 220Ω, ±5%, 1/4W	1066-2215	Allen-Bradley	CB2215
R23	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R24	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R25	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R26	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R27	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R28	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R29	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R30	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025

MARKER AND VARIABLE OSCILLATOR (cont). 2400

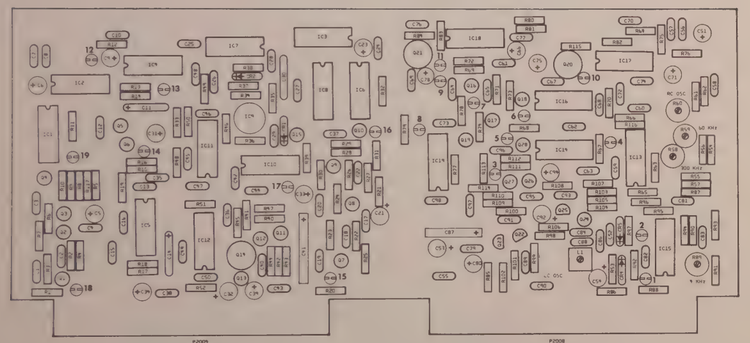
CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R31	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R32	Comp, 2.7Ω, ±5%, 1/4W	1066-0007	Allen-Bradley	CB27G5
R33	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R34	Metal Film, 10k, ±1%, 1/10W	1074-1029	Dale	MF-1/10-T9
R35	Metal Film, 1.43k, ±1%, 1.8W	1075-0021	Dale	MFF-1/8-T1
R36	Comp, 5.1Ω, ±5%, 1/4W	1066-0002	Allen-Bradley	CB51G5
R37	WW, 11.4k, ±1/2%, .15W	1177-0003	Jordon	J110 Size
R38	Comp, 5.1Ω, ±5%, 1/4W	1066-0002	Allen-Bradley	CB51G5
R39	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R40	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R41	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R42	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R43	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R44	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R45	Metal Film, 69.8k, ±1%, 1/8W	1075-0100	Dale	MFF-1/8-T1
R46	Metal Film, 33.2k, ±1%, 1/8W	1075-0098	Dale	MFF-1/8-T1
R47	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R48	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R49	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R50	Metal Film, 78.7k, ±1%, 1/8W	1075-0060	Dale	MFF-1/8-T1
R51	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R52	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R53	Comp, 5.1Ω, ±5%, 1/4W	1066-0002	Allen-Bradley	CB51G5
R54	Metal Film, 10k, ±1%, 1/10W	1074-1029	Dale	MF-1/10-T9
R55	Comp, 5.1k, ±5%, 1/4W	1066-5125	Allen-Bradley	CB5125
R56	Metal Film, 61.9k, ±1%, 1/8W	1075-0018	Dale	MFF-1/8-T1
R57	Comp, 5.1k, ±5%, 1/4W	1066-5125	Allen-Bradley	CB5125
R58	Pot, 20k, ±20%, 1/2W	1203-0055	Bourns	3339H-1-203
R59	Pot, 50k, ±20%, 1/2W	1203-0059	Bourns	3339H-1-503
R60	Pot, 5k, ±20%, 1/2W	1203-0054	Bourns	3339H-1-502
R61	Metal Film, 15k, ±1%, 1/8W	1075-0081	Dale	MFF-1/8-T1
R62	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R63	Comp, 5.1k, ±5%, 1/4W	1066-5125	Allen-Bradley	CB5125
R64	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R65	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R66	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R67	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R68	Metal Film, 10k, ±1%, 1/10W	1074-1029	Dale	MF-1/10-T9
R69	Comp, 680Ω, ±5%, 1/4W	1066-6815	Allen-Bradley	CB6815
R70	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R71	Comp, 680Ω, ±5%, 1/4W	1066-6815	Allen-Bradley	CB6815
R72	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R73	Metal Film, 10k, ±1%, 1/10W	1074-1029	Dale	MF-1/10-T9
R74	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R75	Metal Film, 4.99k, ±1%, 1/8W	1075-0095	Dale	MFF-1/8-T1
R76	Metal Film, 15k, ±1%, 1/8W	1075-0081	Dale	MFF-1/8-T1
R77	Metal Film, 2k, ±1%, 1/8W	1075-0079	Dale	MFF-1/8-T1
R78	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R79	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R80	Metal Film, 6.98k, ±1%, 1/10W	1074-1028	Dale	MF-1/10-T1
R81	Metal Film, 4.99k, ±1%, 1/8W	1075-0095	Dale	MFF-1/8-T1
R82	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R83	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R84	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R85	Comp, 3.3Ω, ±5%, 1/4W	1066-0006	Allen-Bradley	CB33G5

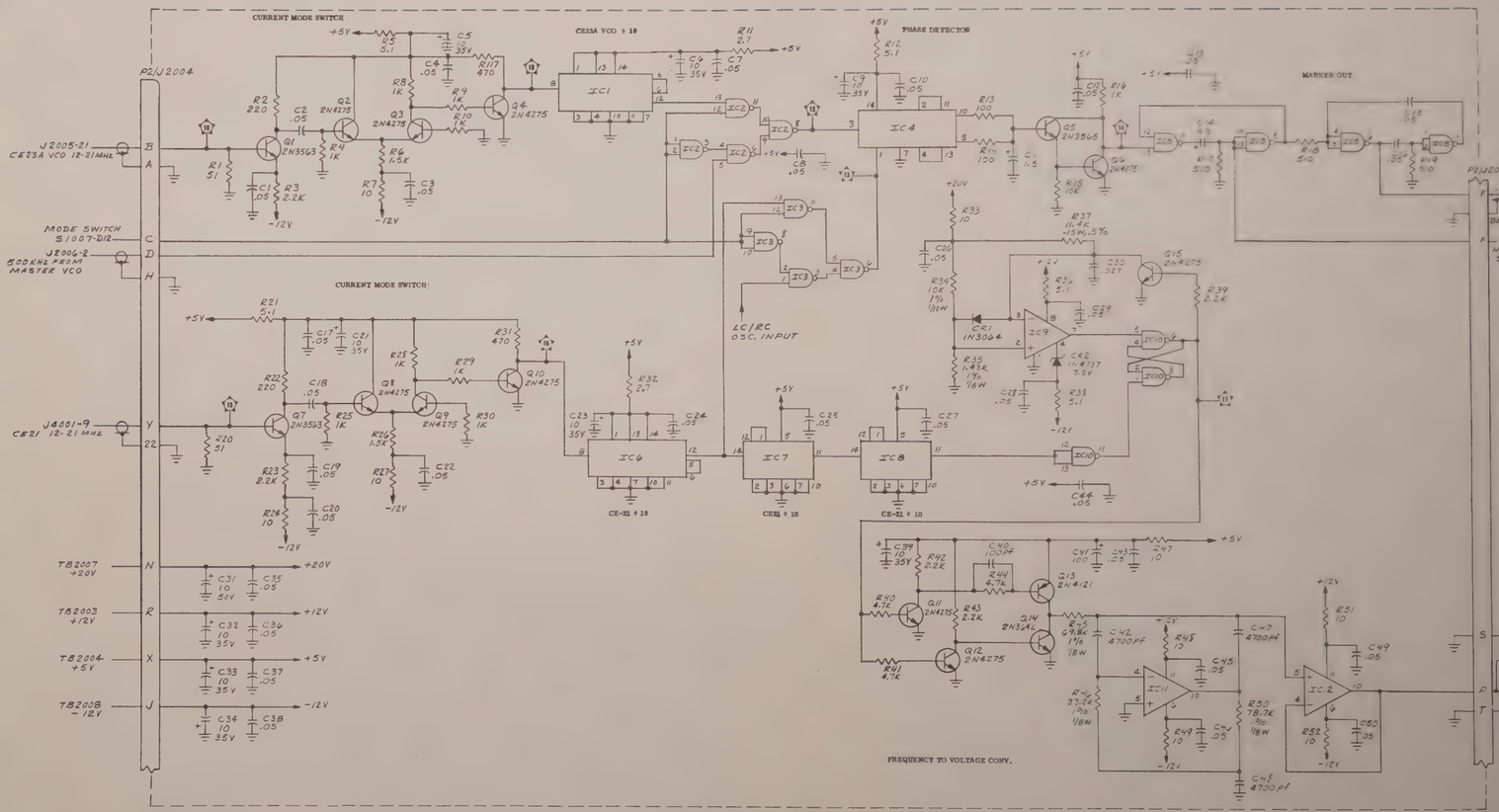
MARKER AND VARIABLE OSCILLATOR (cont). 2400

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R86	Comp, 5.1k, ±5%, 1/4W	1066-5125	Allen-Bradley	CB5125
R87	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R88	Metal Film, 4.99k, ±1%, 1/8W	1075-0095	Dale	MFF-1/8-T1
R89	Pot, 20k, ±20%, 1/2W	1203-0055	Bourns	3339H-1-203
R90	Metal Film, 20k, ±1%, 1/8W	1075-0096	Dale	MFF-1/8-T1
R91	Metal Film, 1.24k, ±1%, 1/8W	1075-0087	Dale	MFF-1/8-T1
R92	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R93	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R94	Metal Film, 10k, ±1%, 1/10W	1074-1029	Dale	MF-1/10-T9
R95	Metal Film, 24.3k, ±1%, 1/10W	1074-1031	Dale	MF-1/10-T9
R96	Metal Film, 10k, ±1%, 1/10W	1074-1029	Dale	MF-1/10-T9
R97	Metal Film, 39.2k, ±1%, 1/10W	1074-1032	Dale	MF-1/10-T9
R98	Comp, 680k, ±5%, 1/4W	1066-6845	Allen-Bradley	CB6845
R99	Comp, 680k, ±5%, 1/4W	1066-6845	Allen-Bradley	CB6845
R100	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R101	Comp, 68k, ±5%, 1/4W	1066-6835	Allen-Bradley	CB6835
R102	Comp, 6.8k, ±5%, 1/4W	1066-6825	Allen-Bradley	CB6825
R103	Comp, 120k, ±5%, 1/4W	1066-1245	Allen-Bradley	CB1245
R104	Comp, 2 Meg, ±5%, 1/4W	1066-2055	Allen-Bradley	CB2055
R105	Comp, 120k, ±5%, 1/4W	1066-1245	Allen-Bradley	CB1245
R106	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R107	Comp, 820Ω, ±5%, 1/4W	1066-8215	Allen-Bradley	CB8215
R108	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R109	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R110	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R111	Comp, 2k, ±5%, 1/4W	1066-2025	Allen-Bradley	CB2025
R112	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R113	Comp, 51k, ±5%, 1/4W	1066-5135	Allen-Bradley	CB5135
R114	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R115	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R116	Metal Film, 10k, ±1%, 1/10W	1074-1029	Dale	MF-1/10-T9
R117	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
	TRANSISTORS			
Q1	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q2	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q3	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q4	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q5	Si, NPN, 2N3565	1272-0017	Fairchild	2N4275
Q6	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q7	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q8	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q9	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q10	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q11	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q12	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q13	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q14	Si, NPN, 2N3642	1272-0018	Fairchild	2N3642
Q15	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q16	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q17	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q18	Si, PNP, 2N4249	1272-0024	Fairchild	2N4249
Q19	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q20	Si, NPN, 2N3642	1272-0018	Fairchild	2N4249

MARKER AND VARIABLE OSCILLATOR (cont). 2400

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
Q21	Si, NPN, 2N3642	1272-0018	Fairchild	2N3642
Q22	Si, NPN, 2N5962	1272-0059	Fairchild	2N5962
Q23	Si, NPN, 2N5962	1272-0059	Fairchild	2N5962
Q24	J-FET, LS4416	1272-0048	Ledel	LS4416
Q25	Si, PNP, 2N5087	1272-0038	Motorola	2N5087
Q26	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q27	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q28	Si, PNP, 2N4249	1272-0024	Fairchild	2N4249





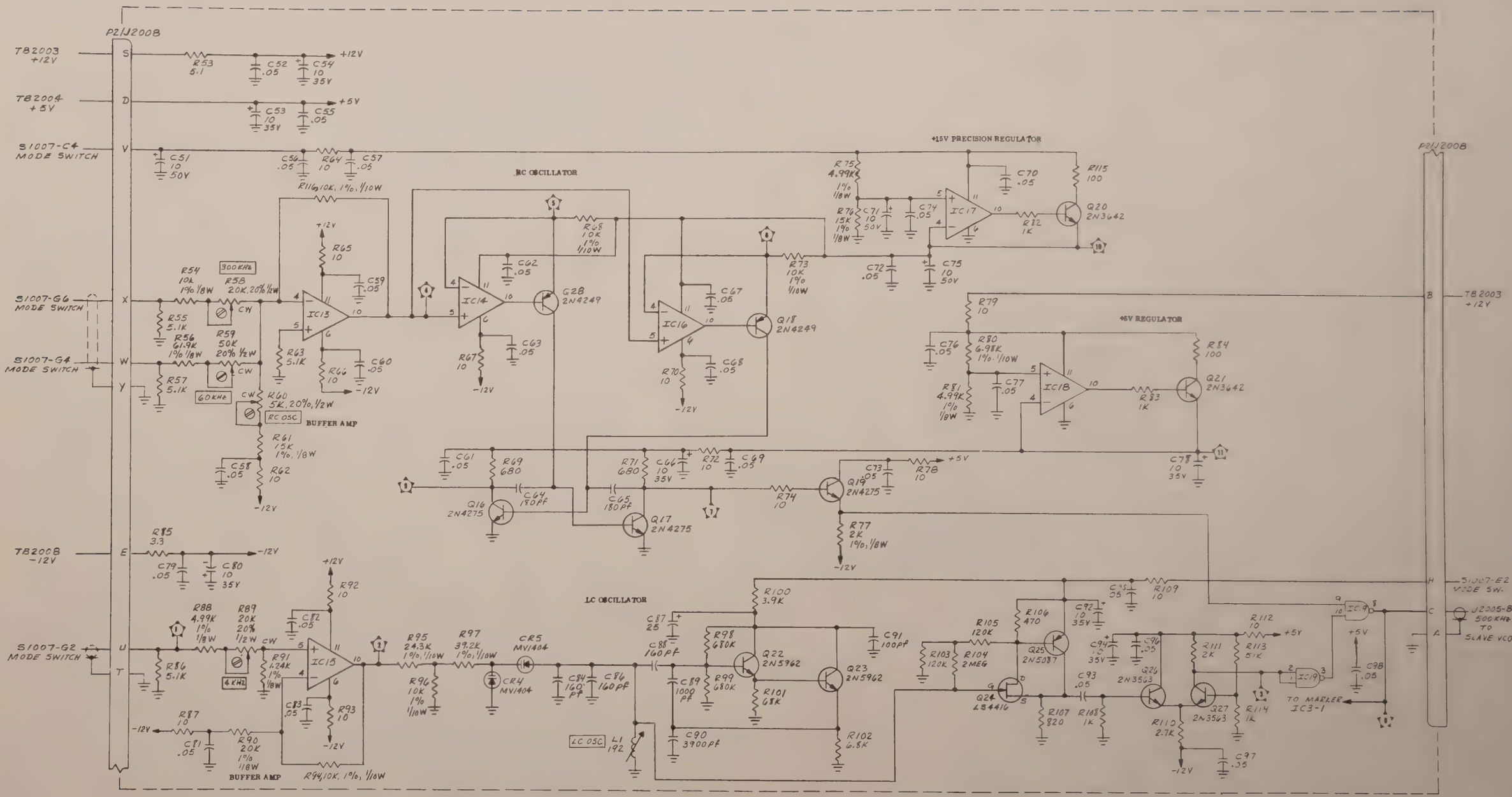
NOTE:

1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.
6. ALL 13 RESISTORS ARE 1/10 W MIN.

IC NO.	TYPE	VCC	GND
1,6	SN74196N		
2,3,5,10,19	SN7400N	14	7
9	MA710C		
4	MC4044P		
11,12,13,14 15,16,17,18	SN72741N		
7,8	SN7490N		

5601**0047

Figure 3-6. Marker and Variable Oscillator, Sheet 1. 2400



NOTE:

1. RESISTORS – 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS – VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS – VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.
6. ALL 1% RESISTORS ARE 1/10 W MIN.

Figure 3-7. Marker and Variable Oscillator, Sheet 2. 2400

SLAVE PHASE LOCK LOOP. 2500

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	Slave Phase Lock Loop P.C. Board Assy	7001-0220	Cushman	
	P.C. Board	1780-0409	Cushman	
	CAPACITORS			
C1	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C2	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C3	Tant, 10μF, ±20%, 50V	1011-0011	Kemet	T368C106M050AS
C4	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C5	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5855-512-Y5U-103Z
C6	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C7	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C8	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C9	Mica, 1800pF, ±5%, 500V	1002-0073	Elmenco	DM19-F-182J
C10	Mica, 87pF, ±1%, 500V	1002-0047	Elmenco	DM15-E-870F
C11	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C12	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C13	Mica, 2400pF, ±5%, 500V	1002-0074	Elmenco	DM19-F-242J
C14	Mica, 33pF, ±5%, 500V	1002-0024	Elmenco	DM15-E-330J
C15	Mica, 430pF, ±5%, 500V	1002-0034	Elmenco	DM15-F-431J
C16	Mica, 1800pF, ±5%, 500V	1002-0073	Elmenco	DM19-F-182J
C17	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C18	Tant, 100μF, ±20%, 20V	1011-0010	Kemet	T362D107M020AS
C19	Mica, 1600pF, ±5%, 500V	1002-0072	Elmenco	DM19-F-162J
C20	Mica, 240pF, ±5%, 500V	1002-0030	Elmenco	DM15-F-241J
C21	Mica, 2000pF, ±5%, 500V	1002-0077	Elmenco	DM19-E-202J
C22	Mica, 100pF, ±5%, 500V	1002-0011	Elmenco	DM15-F-101J
C23	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C24	Mica, 1100pF, ±5%, 500V	1002-0071	Elmenco	DM19-F-112J
C25	Mylar, .39μF, ±10%, 200V	1008-0037	Electrocube	625B1C394K2
C26	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C27	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C28	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C29	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C30	Mica, 560pF, ±5%, 300V	1002-0037	Elmenco	DM15-F-561J
C31	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C32	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	Tag 10/35-20
C33	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C34	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C35	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C36	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C37	Tant, 10μF, ±20%, 50V	1011-0011	Kemet	T368C106M050AS
C38	Mica, 560pF, ±5%, 300V	1002-0037	Elmenco	DM15-F-561J
C39	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	Tag 10-35-20
C40	Mica, 270pF, ±5%, 500 V	1002-0031	Elmenco	DM15-F-271J
C41	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	Tag 10-35-20
C42	Cer, .05μF, +80-20%, 25V	1005-0012	Erie	5855-505-Y5U0-503Z
C43	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	Tag 10-35-20
C44	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C45	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C46	Mica, 27pF, ±5%, 500V	1002-0008	Elmenco	DM15-E-270J
C47	Mica, 220pF, ±5%, 500V	1002-0029	Elmenco	DM15-F-221J
C48	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C49	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C50	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z

SLAVE PHASE LOCK LOOP (cont). 2500

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
C51	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C52	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C53	Cer, .1μF, +80-20%, 75V	1005-0019	Centralab	DDA-104
C54	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C55	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C56	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C57	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C58	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C59	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	Tag 10-35-20
C60	Mylar, .39μF, ±10%, 200V	1008-0037	Electrocube	625B1C394K2
C61	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C62	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C63	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C64	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C65	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C66	Cer, .1μF, +80-20%, 75V	1005-0019	Centralab	DDA-104
C67	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C68	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C69	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C70	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C71	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C72	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C73	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C74	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C75	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C76	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C77	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	Tag 10-35-20
C78	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C79	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C80	Tant, 100μF, ±20%, 20V	1011-0010	Kemet	T362D107M020AS
C81	Tant, 10μF, ±20%, 50V	1011-0011	Kemet	T368C106M050AS
C82	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C83	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	Tag 10/35-20
C84	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C85	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	Tag 10/35-20
C86	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C87	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	Tag 10/35-20
C88	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C89	Cer, .1μF, +80-20%, 75V	1005-0019	Centralab	DDA-104
	COILS			
L1	RF Choke, 2.2μH, ±10%	1585-0013	Delevan	1537-20
L2	RF Choke, 2.2μH, ±10%	1585-0013	Delevan	1537-20
L3	RF Choke, 1μH, ±10%	1585-0027	Delevan	1537-12
L4	RF Choke, 1.5μH, ±10%	1585-0038	Delevan	1537-16
L5	RF Choke, 1000μH, ±5%	1585-0020	Delevan	2500-28
L6	RF Choke, 1000μH, ±5%	1585-0020	Delevan	2500-28
L7	Var, 1.1-2.5μH	1596-0067	Cushman	
L8	RF Choke, 22μH, ±15%	1585-0029	Delevan	2534-56
L9	RF Choke, 820μH, ±5%	1585-0050	Delevan	2500-24
L10	RF Choke, 820μH, ±5%	1585-0050	Delevan	2500-24
L11	RF Choke, 22mH, ±15%	1585-0050	Delevan	2534-56
L12	RF Choke, 1000μH, ±5%	1585-0020	Delevan	2500-28
L13	RF Choke, 15μH, ±10%	1585-0051	Delevan	1025-48

SLAVE PHASE LOCK LOOP (cont). 2500

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	DIODES			
CR1	Zener, ±5%, 1N4733A	1281-0031	Motorola	1N4733A
CR2	Diode, HPA-2800	1283-0001	HPA	HPA-2800
CR3	Diode, HPA-2800	1283-0001	HPA	HPA-2800
CR4	Diode, HPA-2800	1283-0001	HPA	HPA-2800
CR5	Diode, HPA-2800	1283-0001	HPA	HPA-2800
CR6	Diode, G633	1282-0005	ITT	G633
CR7	Si, Varicap, MV1403	1281-0060	Motorola	MV1403
CR8	Si, Varicap, MV1403	1281-0060	Motorola	MV1403
CR9	Si, Varicap, MV1403	1281-0060	Motorola	MV1403
CR10	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR11	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR12	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR13	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR14	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR15	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR16	Diode, G633	1282-0005	ITT	G633
CR17	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR18	Diode, G633	1282-0005	ITT	G633
CR19	Diode, G633	1282-0005	ITT	G633
CR20	Diode, G633	1282-0005	ITT	G633
	INTEGRATED CIRCUITS			
IC1	Differential Comparator, High Speed	2025-0028	Fairchild	UA710C
IC2	Phase Detector	2025-0066	Motorola	MC4044P
IC3	High Performance Op-Amp.	2025-0022	T.I.	SN72741N
IC4	High Performance Op-Amp.	2025-0022	T.I.	SN72721N
IC5	High Performance Op-Amp.	2025-0022	T.I.	SN72741N
IC6	High Performance Op-Amp	2025-0022	T.I.	SN72741N
IC7	High Performance Op-Amp	2025-0022	T.I.	SN72741N
IC8	High Performance Op-Amp	2025-0022	T.I.	SN72741N
	RESISTORS			
R1	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R2	Comp, 3.3Ω, ±5%, 1/4W	1066-0006	Allen-Bradley	CB0006
R3	Comp, 3.3Ω, ±5%, 1/4W	1066-0006	Allen-Bradley	CB0006
R4	Comp, 30Ω, ±5%, 1/4W	1066-3005	Allen-Bradley	CB3005
R5	Metal Film, 14.7k, ±1%, 1/10W	1074-1020	Dale	MF-1/10-T1
R6	Metal Film, 14.7k, ±1%, 1/10W	1074-1020	Dale	MF-1/10-T1
R7	Metal Film, 51.1Ω, ±1%, 1/8W	1075-0077	Dale	MFF-1/8-T1
R8	Metal Film, 26.1Ω, ±1%, 1/10W	1074-1011	Dale	MF-1/10-T1
R9	Metal Film, 9.09k, ±1%, 1/10W	1074-1019	Dale	MF-1/10-T1
R10	Metal Film, 5.62k, ±1%, 1/8W	1075-0013	Dale	MFF-1/8-T1
R11	Metal Film, 887Ω, ±1%, 1/8W	1075-0022	Dale	MFF-1/8-T1
R12	Comp, 510Ω, ±5%, 1/4W	1066-5115	Allen-Bradley	CB5115
R13	Not Used			
R14	Comp, 120Ω, ±5%, 1/4W	1066-1215	Allen-Bradley	CB1215
R15	Comp, 24Ω, ±5%, 1/4W	1066-2405	Allen-Bradley	CB2405
R16	Comp, 5.1Ω, ±5%, 1/4W	1066-0002	Allen-Bradley	CB51G5
R17	Metal Film, 3.16k, ±1%, 1/10W	1074-1016	Dale	MF-1/10-T1
R18	Metal Film, 383k, ±1%, 1/10W	1074-1013	Dale	MF-1/10-T1
R19	Metal Film, 51.1k, ±1%, 1/8W	1075-0099	Dale	MFF-1/8-T1
R20	Metal Film, 511Ω, ±1%, 1/10W	1074-1008	Dale	MF-1/10-T1
R21	Comp, 2.7k, ±5%, 1/4W	1066-2725	Allen-Bradley	CB2725
R22	Metal Film, 1.62k, ±1%, 1/8W	1075-0070	Dale	MFF-1/8-T9
R23	Metal Film, 10k, ±1%, 1/8W	1075-0009	Dale	MFF-1/8-T1
R24	Comp, 6.2k, ±5%, 1/4W	1066-6225	Allen-Bradley	CB6225
R25	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715

SLAVE PHASE LOCK LOOP (cont). 2500

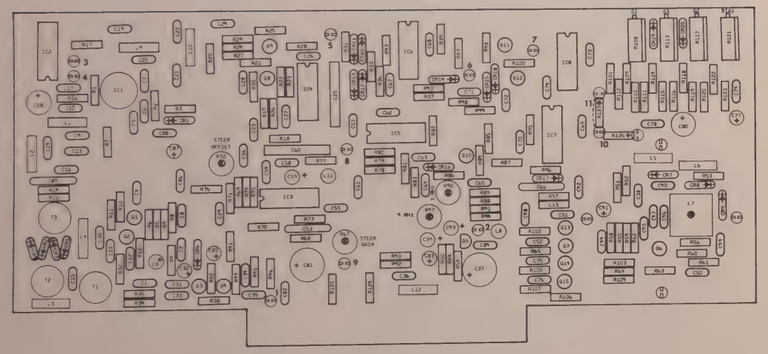
CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R26	Metal Film, 162Ω, ±1%, 1/10W	1074-1009	Dale	MF-1/10-T1
R27	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225
R28	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R29	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R30	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R31	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R32	Metal Film, 27.4Ω, ±1%, 1/10W	1074-1012	Dale	MF-1/10-T1
R33	Metal Film, 23.2k, ±1%, 1/10W	1074-1006	Dale	MF-1/10-T1
R34	Metal Film, 36.5Ω, ±1%, 1/10W	1074-1010	Dale	MF-1/10-T1
R35	Metal Film, 27.4Ω, ±1%, 1/10W	1074-1012	Dale	MF-1/10-T1
R36	Metal Film, 24.3k. ±1%, 1/10W	1074-1031	Dale	MF-1/10-T9
R37	Metal Film, 24.3k, ±1%, 1/10W	1074-1031	Dale	MF-1/10-T9
R38	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R39	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R40	Metal Film, 24.3k, ±1%, 1/10W	1074-1031	Dale	MF-1/10-T9
R41	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R42	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R43	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R44	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R45	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225
R46	Metal Film, 51.1Ω, ±1%, 1/8W	1075-0077	Dale	MFF-1/8-T1
R47	Metal Film, 10k, ±1%, 1/8W	1075-0009	Dale	MFF-1/8-T1
R48	Comp, 1 MEG, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R49	Metal Film, 3.57k, ±1%, 1/8W	1075-0056	Dale	MFF-1/8-T1
R50	Metal Film, 6.34k, ±1%, 1/10W	1074-1007	Dale	MF-1/10-T1
R51	Metal Film, 10k, ±1%, 1/8W	1075-0009	Dale	MFF-1/81T1
R52	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R53	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R54	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R55	Metal Film, 15k, ±1%, 1/8W	1074-0081	Dale	MFF-1/8-T1
R56	Metal Film, 4.6k, ±1%, 1/10W	1074-1005	Dale	MF-1/10-T9
R57	Comp, 200Ω, ±5%, 1/4W	1066-2015	Allen-Bradley	CB2015
R58	Metal Film, 51.1Ω, ±1%, 1/8W	1075-0077	Dale	MFF-1/8-T1
R59	Metal Film, 182Ω, ±1%, 1/10W	1074-1014	Dale	MF-1/10-T1
R60	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R61	Metal Film, 200Ω, ±1%, 1/8W	1075-0082	Dale	MFF-1/8-T1
R62	Metal Film, 511Ω, ±1%, 1/10W	1074-1008	Dale	MF-1/10-T1
R63	Metal Film, FSV, ±1%, 1/10W	1074-XXXX		
R64	Comp, 200Ω, ±5%, 1/4W	1066-2015	Allen-Bradley	CB2015
R65	Comp, 820Ω, ±5%, 1/4W	1066-8215	Allen-Bradley	CB8215
R66	Not Used			
R67	Pot, 20k, ±20%, 1/2W	1203-0055	Bourns	3339H-1-203
R68	Metal Film, 24.3k, ±1%, 1/10W	1074-1031	Dale	MF-1/10-T9
R69	Metal Film, 18.7k, ±1%, 1/10W	1074-1022	Dale	MF-1/10-T1
R70	Metal Film, 100k, ±1%, 1/8W	1075-0105	Dale	MFF-1/8-T1
R71	Comp, 510Ω, ±5%, 1/4W	1066-5115	Allen-Bradley	CB5115
R72	Pot, 1k, ±20%, 1/2W	1203-0058	Bourns	3339H-1-102
R73	Metal Film, 100k, ±1%, 1/8W	1075-0105	Dale	MFF-1/8-T1
R74	Metal Film, 18.2k, ±1%, 1/8W	1075-0075	Dale	MFF-1/8-T0
R75	Metal Film, 1.69k, ±1%, 1/10W	1074-1015	Dale	MF-1/10-T1
R76	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R77	Comp, 200Ω, ±5%, 1/4W	1066-2015	Allen-Bradley	CB2015
R78	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R79	Metal Film, 53.6k, ±1%, 1/10W	1074-1023	Dale	MF-1/10-T1
R80	Metal Film, 10k, ±1%, 1/8W	1075-0009	Dale	MFF-1/8-T1
R81	Comp, 6.2k, ±5%, 1/4W	1066-6225	Allen-Bradley	CB6225
R82	Metal Film, 20k, ±1%, 1/8W	1075-0096	Dale	MFF-1/8-T1
R83	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015

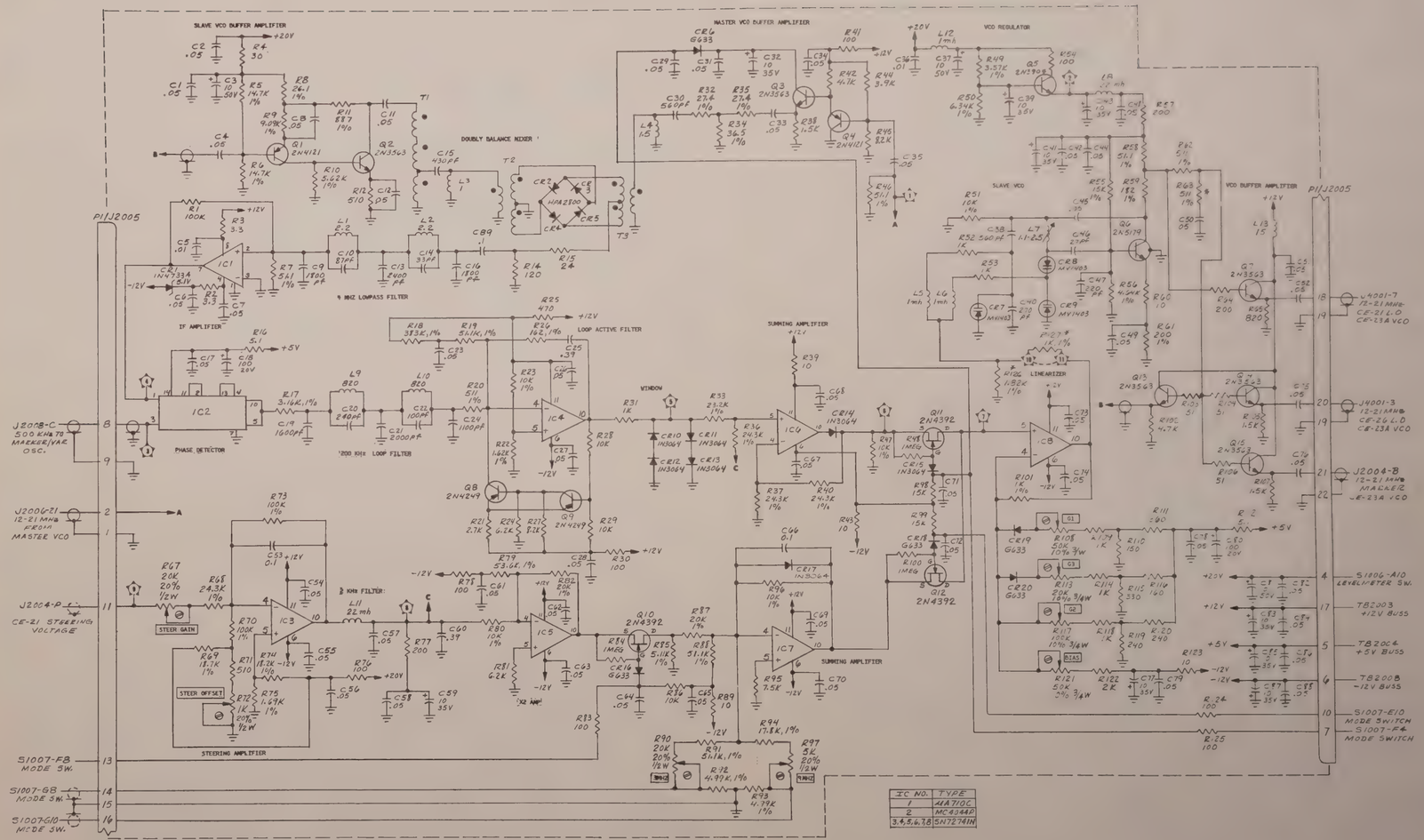
SLAVE PHASE LOCK LOOP (cont). 2500

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R84	Comp, 1 MEG, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R85	Metal Film, 5.11k, ±1%, 1/10W	1074-1018	Dale	MF-1/10-T1
R86	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R87	Metal Film, 20k, ±1%, 1/8W	1075-0096	Dale	MFF-1/8-T1
R88	Metal Film, 51.1k, ±1%, 1/8W	1075-0099	Dale	MFF-1/8-T1
R89	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R90	Pot, 20k, ±20%, 1/2W	1203-0055	Bourns	3339H-1-203
R91	Metal Film, 51.1k, ±1%, 1/8W	1075-0099	Dale	MFF-1/8-T1
R92	Metal Film, 4.99k, ±1%, 1/8W	1075-0095	Dale	MFF-1/8-T1
R93	Metal Film, 4.99k, ±1%, 1/8W	1075-0095	Dale	MFF-1/8-T1
R94	Metal Film, 17.8k, ±1%, 1/10W	1074-1021	Dale	MF-1/10-T1
R95	Comp, 7.5k, ±5%, 1/4W	1066-7525	Allen-Bradley	CB7525
R96	Metal Film, 10k, ±1%, 1/8W	1075-0009	Dale	MFF-1/8-T1
R97	Pot, 5k, ±20%, 1/2W	1203-0054	Bourns	3339H-1-502
R98	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R99	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R100	Comp, 1 MEG, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R101	Metal Film, 1k, ±1%, 1/8W	1075-0037	Dale	MFF-1/8-T1
R102	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R103	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R104	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R105	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R106	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R107	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R108	Pot, 50k, ±10%, 3/4W	1215-0023	Beckman	89WR
R109	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R110	Comp, 150Ω, ±5%, 1/4W	1066-1515	Allen-Bradley	CB1515
R111	Comp, 360Ω, ±5%, 1/4W	1066-3615	Allen-Bradley	CB3615
R112	Comp, 5.1Ω, ±5%, 1/4W	1066-0002	Allen-Bradley	CB51G5
R113	Pot, 20k, ±10%, 3/4W	1215-0021	Beckman	89WR
R114	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R115	Comp, 330Ω, ±5%, 1/4W	1066-3315	Allen-Bradley	CB3315
R116	Comp, 160Ω, ±5%, 1/4W	1066-1615	Allen-Bradley	CB1615
R117	Pot, 100k, ±10%, 3/4W	1215-0006	Helitrim	89WR
R118	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R119	Comp, 240Ω, ±5%, 1/4W	1066-2415	Allen-Bradley	CB2415
R120	Comp, 240Ω, ±5%, 1/4W	1066-2415	Allen-Bradley	CB2415
R121	Pot, 50k, ±10%, 3/4W	1215-0023	Beckman	89WR
R122	Comp, 2k, ±5%, 1/4W	1066-2025	Allen-Bradley	CB2025
R123	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R124	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R125	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R126	Metal Film, FSV, ±1%, 1/8W	1075-XXXX		
R127	Metal Film, FSV, ±1%, 1/8W	1075-XXXX		
	TRANSFORMERS			
T1	Torroid, Trifilar	1579-0017	Cushman	
T2	Torriod, Trifilar	1579-0017	Cushman	
T3	Torriod, Trifilar	1579-0017	Cushman	
	TRANSISTORS			
Q1	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q2	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q3	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q4	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q5	Si, NPN, 2N3904	1272-0032	Motorola	2N3904

SLAVE PHASE LOCK LOOP (cont). 2500

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
Q6	Si, NPN, 2N5179	1272-0060	Motorola	2N5179
Q7	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q8	Si, PNP, 2N4249	1272-0024	Fairchild	2N4249
Q9	Si, PNP, 2N4249	1272-0024	Fairchild	2N4249
Q10	FET, N-Channel	1272-0054	Teledyne	2N4392
Q11	FET, N-Channel	1272-0054	Teledyne	2N4392
Q12	FET, N-Channel	1272-0054	Teledyne	2N4392
Q13	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q14	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q15	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563





IC NO.	TYPE
1	MA710C
2	MC4044D
3,4,5,6,7,8	SN72741N

NOTE:
1. RESISTORS – 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS – VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS – VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.
6. ALL 1% RESISTORS ARE 1/10 W MIN.

5601**0047

Figure 3-8. Slave Phase Lock Loop. 2500

MASTER PHASE LOCK LOOP. 2600

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	Master Phase Lock Loop P.C. Board Assy.	7001-0224	Cushman	
	P.C. Board	1780-0406	Cushman	
	CAPACITORS			
C1	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C2	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C3	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	Tag 10/35-20
C4	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C5	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C6	Mica, 560pF, ±5%, 500V	1002-0037	Elmenco	DM15-F-561J
C7	Mica, 430pF, ±5%, 500V	1002-0034	Elmenco	DM15-F-431J
C8	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C9	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C10	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C11	Tant, 10μF, ±20%, 50V	1011-0011	Kemet	T368C106M050AS
C12	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C13	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C14	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C15	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C16	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	Tag 10/35-20
C17	Mica, 560pF, ±5%, 500V	1002-0037	Elmenco	DM15-F-561J
C18	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C19	Mica, 27pF, ±5%, 500V	1002-0008	Elmenco	DM15-E-270J
C20	Mica, 270pF, ±5%, 500V	1002-0031	Elmenco	DM15-F-271J
C21	Mica, 220pF, ±5%, 500V	1002-0029	Elmenco	DM15-F-271J
C22	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C23	Cer. .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C24	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	Tag 10/35-20
C25	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C26	Tant, 10μF, ±20%, 50V	1011-0011	Kemet	T368C106M050AS
C27	Tant, 10μF, ±20%, 50V	1011-0011	Kemet	T368C106M050AS
C28	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C29	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C30	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C31	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C32	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C33	Elect, 100μF, +75-10%, 12V	1013-0011	Sprague	30D107G012CC5
C34	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C35	Mica, 1800pF, ±5%, 500V	1002-0073	Elmenco	DM19-F-182J
C36	Mica, 87pF, ±1%, 500V	1002-0047	Elmenco	DM15-E-870F
C37	Mica, 1600pF, ±5%, 500V	1002-0072	Elmenco	DM19-F-162J
C38	Mica, 33pF, ±5%, 500V	1002-0024	Elmenco	DM15-E-330J
C39	Mica, 2400pF, ±5%, 500V	1002-0074	Elmenco	DM19-F-242J
C40	Mica, 240pF, ±5%, 500V	1002-0030	Elmenco	DM15-F-241J
C41	Mica, 1800pF, ±5%, 500V	1002-0073	Elmenco	DM19-F-182J
C42	Mica, 2000pF, ±5%, 500V	1002-0077	Elmenco	DM19-E-202J
C43	Mica, 100pF, ±5%, 500V	1002-0011	Elmenco	DM15-F-101J
C44	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C45	Mica, 1100pF, ±5%, 500V	1002-0071	Elmenco	DM19-F-112J
C46	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C47	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C48	Poly, .39μF, ±10%, 200V	1008-0037	Electrocube	625B1C394K2
C49	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C50	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z

MASTER PHASE LOCK LOOP (cont). 2600

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
C51	Cer, .022μF, ±20%, 500V	1005-0003	Erie	831-596-Z5U-202M
C52	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C53	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C54	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	Tag 10/35-20
C55	Poly, .39μF, ±10%, 200V	1008-0037	Electrocube	625B1C394K2
C56	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C57	Cer, .1μF, +80-20%, 75V	1005-0019	Centralab	DDA104
C58	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C59	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C60	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C61	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C62	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C63	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	Tag 10/35-20
C64	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	Tag 10/35-20
C65	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C66	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C67	Poly, 1.0μF, ±5%, 50V	1008-0081	Electrocube	625B1A105J
C68	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C69	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C70	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C71	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C72	Tant, 10μF, ±20%, 50V	1011-0011	Kemet	T368C106M050AS
C73	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C74	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	Tag 10/35-20
C75	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C76	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	Tag 10/35-20
C77	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C78	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	Tag 10/35-20
C79	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C80	Tant, 10μF, ±20%, 50V	1011-0011	Kemet	T368C106M050AS
C81	Cer, .0μF, +80-20%, 75V	1005-0019	Centralab	DDA104
	COILS			
L1	RF Choke, 2.2μH, ±10%	1585-0013	Delevan	1537-20
L2	RF Choke, 820μH, ±5%	1585-0050	Delevan	2500-24
L3	RF Choke, 2.2μH, ±10%	1585-0013	Delevan	1537-20
L4	RF Choke, 820μH, ±5%	1585-0050	Delevan	2500-24
L5	RF Choke, 1.5μH, ±10%	1585-0038	Delevan	1537-16
L6	RF Choke, 1μH, ±5%	1585-0027	Delevan	1537-12
L7	RF Choke, 1000μH, ±5%	1585-0020	Delevan	2500-28
L8	RF Choke, 1000μH, ±5%	1585-0020	Delevan	2500-28
L9	Var, 1.1-2.5μH	1596-0067	Cushman	
L10	RF Choke, 22mH, ±15%	1585-0029	Delevan	2534-56
L11	RF Choke, 1000μH, ±5%	1585-0020	Delevan	2500-28
L12	RF Choke, 22mH, ±15%	1585-0029	Delevan	2534-56
L13	RF Choke, 1000μH, ±5%	1585-0020	Delevan	2500-28
	CRYSTAL			
X1	Crystal, 500 KHz	2035-0019	Cushman	
	DIODES			
CR1	Zener, ±5%, 1N4733A	1281-0031	Motorola	1N4733A
CR2	HPA-2800	1283-0001	HPA	HPA-2800
CR3	HPA-2800	1283-0001	HPA	HPA-2800
CR4	HPA-2800	1283-0001	HPA	HPA-2800
CR5	HPA-2800	1283-0001	HPA	HPA-2800

MASTER PHASE LOCK LOOP (cont). 2600

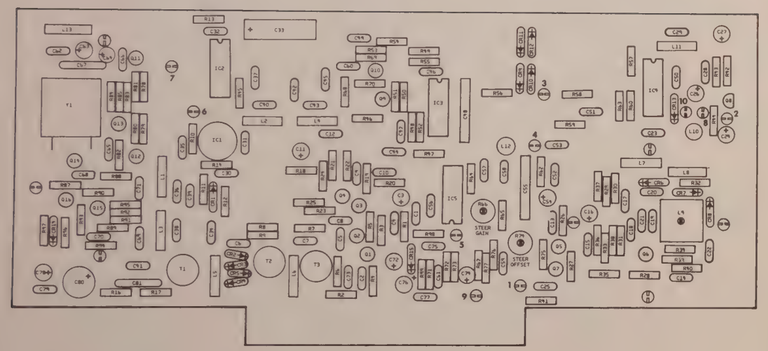
CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
CR6	Si, Varactor, MV1403	1281-0060	Motorola	MV1403
CR7	Si, Varactor, MV1403	1281-0060	Motorola	MV1403
CR8	Si, Varactor, MV1403	1281-0060	Motorola	MV1403
CR9	DO-7 pkg. 1N3064	1281-0013	Teledyne	1N3064
CR10	DO-7 pkg. 1N3064	1281-0013	Teledyne	1N3064
CR11	DO-7 pkg. 1N3064	1281-0013	Teledyne	1N3064
CR12	DO-7 pkg. 1N3064	1281-0013	Teledyne	1N3064
CR13	DO-7 pkg. 1N3064	1281-0013	Teledyne	1N3064
CR14	G633	1282-0005	ITT	G633
CR15	G633	1282-0005	ITT	G633
	INTEGRATED CIRCUITS			
IC1	High Speed Differential Comparator	2025-0028	Fairchild	UA710C
IC2	Phase Detector	2025-0066	Motorola	MC4044P
IC3	High Performance Op-Amp	2025-0022	T.I.	SN72741N
IC4	High Performance Op-Amp	2025-0022	T.I.	SN72741N
IC5	High Performance Op-Amp	2025-0022	T.I.	SN72741N
	RESISTORS			
R1	Comp, 5.1Ω, ±5%, 1/4W	1066-0002	Allen-Bradley	CB51G5
R2	Metal Film, 51.1μ, ±1%, 1/8W	1075-0077	Dale	MFF-1/8-T1
R3	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R4	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225
R5	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R6	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R7	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R8	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R9	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R10	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R11	Comp, 3.3Ω, ±5%, 1/4W	1066-0006	Allen-Bradley	CB33G5
R12	Comp, 5.1Ω, ±5%, 1/4W	1066-0002	Allen-Bradley	CB51G5
R13	Comp, 5.1Ω, ±5%, 1/4W	1066-0002	Allen-Bradley	CB51G5
R14	Metal Film, 51.1Ω, ±1%, 1/8W	1075-0077	Dale	MFF-1/8-T1
R15	Not Used			
R16	Comp, 120Ω, ±5%, 1/4W	1066-1215	Allen-Bradley	CB1215
R17	Comp, 24Ω, ±5%, 1/4W	1066-2405	Allen-Bradley	CB2405
R18	Comp, 30Ω, ±5%, 1/4W	1066-3005	Allen-Bradley	CB3005
R19	Metal Film, 887Ω, ±1%, 1/8W	1075-0022	Dale	MFF-1/8- T0
R20	Comp, 510Ω, ±5%, 1/4W	1066-5115	Allen-Bradley	CB5115
R21	Metal Film, 26.1Ω, ±1%, 1/10W	1074-1011	Dale	MF-1/10-T1
R22	Metal Film, 9.09k, ±1%, 1/10W	1074-1019	Dale	MF-1/10-T1
R23	Metal Film, 5.62k, ±1%, 1/8W	1075-0013	Dale	MFF-1/8-T1
R24	Metal Film, 15k, ±1%, 1/8W	1075-0081	Dale	MFF-1/8-T1
R25	Metal Film, 15k, ±1%, 1/8W	1075-0081	Dale	MFF-1/8-T1
R26	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R27	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R28	Metal Film, FSV, ±1%, 1/10W	1074-XXXX		
R29	Metal Film, 10k, ±1%, 1/8W	1075-0009	Dale	MFF-1/8-T1
R30	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R31	Metal Film, 511Ω, ±1%, 1/10W	1074-1008	Dale	MF-1/10-T1
R32	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R33	Metal Film, 15k, ±1%, 1/8W	1075-0081	Dale	MFF-1/8-T1
R34	Metal Film, 4.75k, ±1%, 1/8W	1075-0038	Dale	MFF-1/8-T1
R35	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R36	Metal Film, 51.1Ω, ±1%, 1/8W	1075-0077	Dale	MFF-1/8-T1
R37	Comp, 200Ω, ±5%, 1/4W	1066-2015	Allen-Bradley	CB2015
R38	Metal Film, 182Ω, ±1%, 1/10W	1074-1014	Dale	MF-1/10-T1
R39	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R40	Metal Film, 200Ω, ±1%, 1/8W	1075-0082	Dale	MFF-1/8-T1

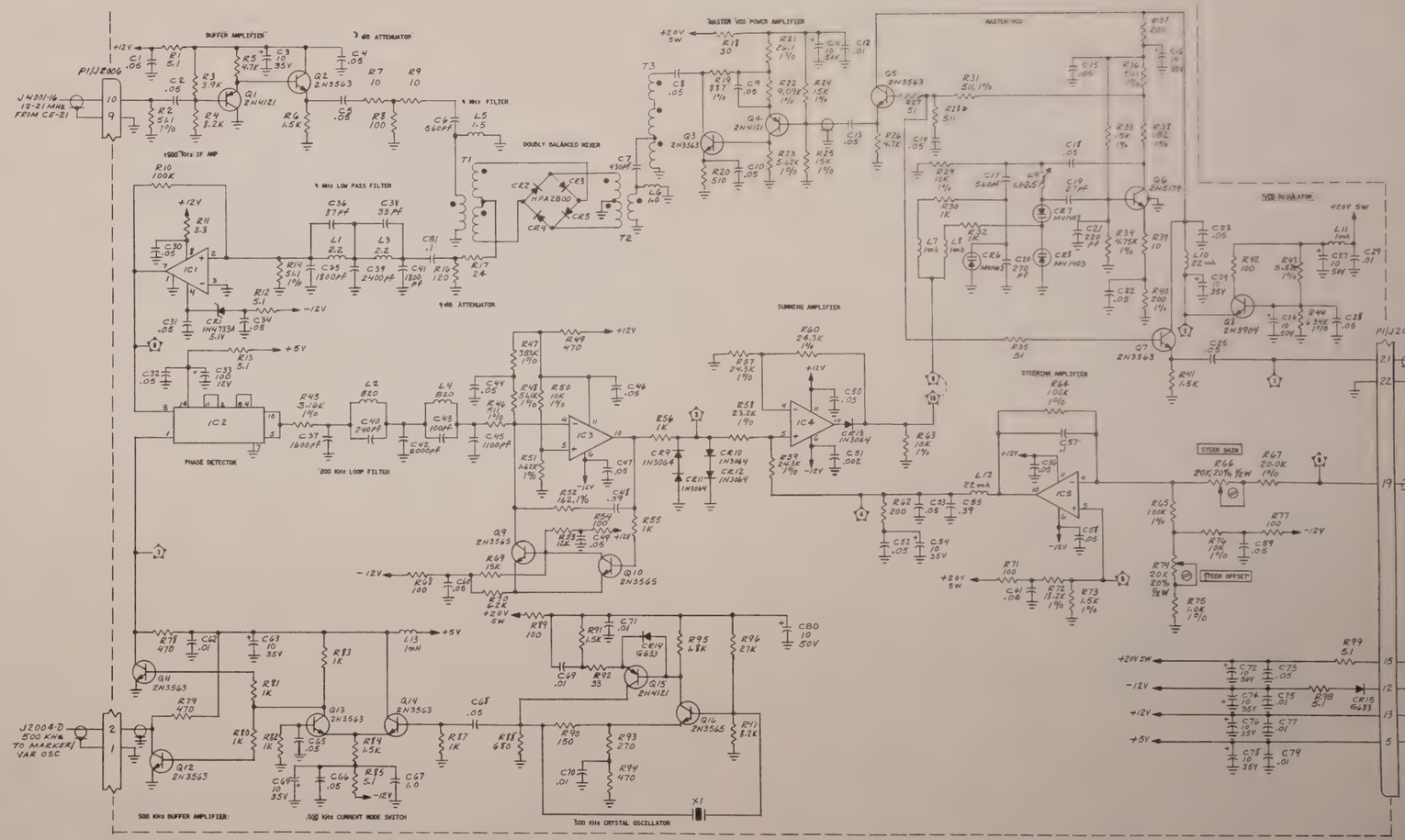
MASTER PHASE LOCK LOOP (cont). 2600

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R41	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R42	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R43	Metal Film, 3.57k, ±1%, 1/8W	1075-0056	Dale	MFF-1/8-T1
R44	Metal Film, 6.34k, ±1%, 1/10W	1074-1007	Dale	MF-1/10-T1
R45	Metal Film, 3.16k, ±1%, 1/10W	1074-1016	Dale	MF-1/10-T1
R46	Metal Film, 511Ω, ±1%, 1/10W	1074-1008	Dale	MF-1/10-T1
R47	Metal Film, 383k, ±1%, 1/10W	1074-1013	Dale	MF-1/10-T1
R48	Metal Film, 51.1k, ±1%, 1/8W	1075-0099	Dale	MFF-1/8-T1
R49	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R50	Metal Film, 10k, ±1%, 1/8W	1075-0009	Dale	MFF-1/8-T1
R51	Metal Film, 1.62k, ±1%, 1/8W	1075-0070	Dale	MFF-1/8-T9
R52	Metal Film, 162Ω, ±1%, 1/10W	1074-1009	Dale	MF-1/10-T1
R53	Comp, 12k, ±5%, 1/4W	1066-1235	Allen-Bradley	CB1235
R54	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R55	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R56	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R57	Metal Film, 24.3k, ±1%, 1/8W	1075-0097	Dale	MFF-1/8-T1
R58	Metal Film, 23.2k, ±1%, 1/10W	1074-1006	Dale	MF-1/10-T1
R59	Metal Film, 24.3k, ±1%, 1/8W	1075-0097	Dale	MFF-1/8-T1
R60	Metal Film, 24.3k, ±1%, 1/8W	1075-0097	Dale	MFF-1/8-T1
R61	Not Used			
R62	Comp, 200Ω, ±5%, 1/4W	1066-2015	Allen-Bradley	CB2015
R63	Metal Film, 10k, ±1%, 1/8W	1075-0009	Dale	MFF-1/8-T1
R64	Metal Film, 100k, ±1%, 1/8W	1075-0105	Dale	MFF-1/8-T1
R65	Metal Film, 100k, ±1%, 1/8W	1075-0105	Dale	MFF-1/8-T1
R66	Pot, 20k, ±20%, 1/2W	1203-0055	Bourns	3339H-1-203
R67	Metal Film, 20k, ±1%, 1/8W	1075-0096	Dale	MFF-1/8-T1
R68	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R69	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R70	Comp, 6.2k, ±5%, 1/4W	1066-6225	Allen-Bradley	CB6225
R71	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R72	Metal Film, 18.2k, ±1%, 1/8W	1075-0075	Dale	MFF-1/8-T0
R73	Metal Film, 1.5k, ±1%, 1/8W	1075-0039	Dale	MFF-1/8-T1
R74	Pot, 20k, ±20%, 1/2W	1203-0055	Bourns	3339H-1-203
R75	Metal Film, 1k, ±1%, 1/8W	1075-0037	Dale	MFF-1/8-T1
R76	Metal Film, 10k, ±1%, 1/8W	1075-0009	Dale	MFF-1/8-T1
R77	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R78	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R79	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R80	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R81	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R82	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R83	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R84	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R85	Comp, 5.1Ω, ±5%, 1/4W	1066-0002	Allen-Bradley	CB51G5
R86	Not Used			
R87	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R88	Comp, 680Ω, ±5%, 1/4W	1066-6815	Allen-Bradley	CB6815
R89	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R90	Comp, 150Ω, ±5%, 1/4W	1066-1515	Allen-Bradley	CB1505
R91	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R92	Comp, 33Ω, ±5%, 1/4W	1066-3305	Allen-Bradley	CB3305
R93	Comp, 270Ω, ±5%, 1/4W	1066-2715	Allen-Bradley	CB2715
R94	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R95	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen-Bradley	CB1825
R96	Comp, 27k, ±5%, 1/4W	1066-2735	Allen-Bradley	CB2735
R97	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225
R98	Comp, 5.1Ω, ±5%, 1/4W	1066-0002	Allen-Bradley	CB51G5

MASTER PHASE LOCK LOOP (cont). 2600

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R99	Comp, 5.1Ω, ±5%, 1/4W	1066-0002	Allen-Bradley	CB51G5
	TRANSFORMERS			
T1	Toroid Trifilar	1579-0017	Cushman	
T2	Toroid Trifilar	1579-0017	Cushman	
T3	Toroid Trifilar	1579-0017	Cushman	
	TRANSISTORS			
Q1	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q2	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q3	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q4	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q5	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q6	Si, NPN, 2N5179	1272-0060	Motorola	2N5179
Q7	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q8	Si, NPN, 2N3904	1272-0032	Motorola	2N3904
Q9	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q10	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q11	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q12	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q13	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q14	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q15	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q16	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565





NOTE:
1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.
6. ALL 1% RESISTORS ARE 1/10 W MIN.

IC NO.	TYPE
1	UA710C
2	MC4044P
3,4,5	SN7274N

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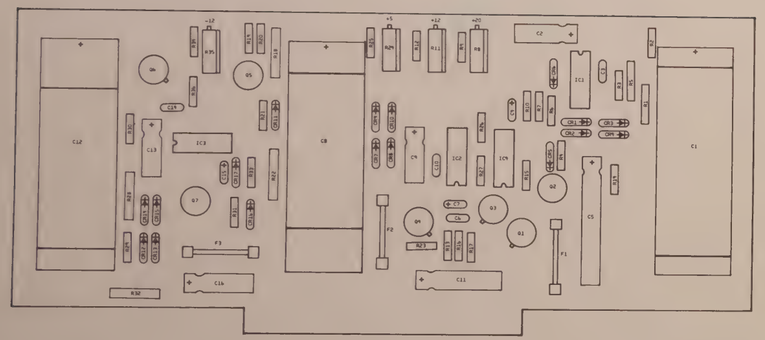
Figure 3-9. Master Phase Lock Loop. 2600

LOW VOLTAGE POWER SUPPLY. 2700

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	Low Voltage Power			
	P.C. Board Assy	7001-0223	Cushman	
	P.C. Board	1780-0414	Cushman	
	CAPACITORS			
C1	Elect, 4700μF, +150-10%, 35V	1014-0018	Ill Elma	35T4700
C2	Elect, 10μF, +75-10%, 150V	1013-0017	Sprague	30D106G150DD5
C3	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C4	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	Tag 10135-20
C5	Elect, 200μF, 25V	1013-0013	Sprague	39D207G025EJ4
C6	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C7	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	Tag 10/35-20
C8	Elect, 4000μF, +75-10%, 25V	1014-0005	Sprague	39D408G025JS5
C9	Elect, 15μF, ±10%, 25V	1013-0005	Sprague	30D156G025BB5
C10	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C11	Elect, 250μF, +75-10%, 16V	1013-0016	Sprague	30D257G016DF2
C12	Elect, 4700μF, +150-10%, 35V	1014-0018	Ill Elma	35T4700
C13	Elect, 15μF, ±10%, 25Y	1013-0005	Sprague	30D156G025BB5
C14	Cer, .01μF, +80-20%, 25V	1005-0013	Erie	5835-512-Y5U-103Z
C15	Tant, 10μF, +50-20%, 35V	1011-0006	ITT	Tag 10/35-20
C16	Elect, 100μF, ±10%, 25V	1013-0003	Sprague	30D107G025DD5
	DIODES			
CR1	100V, PIV, Min.	1281-0023	ITT	1N4002
CR2	100V, PIV, Min.	1281-0023	ITT	1N4002
CR3	100V, PIV, Min.	1281-0023	ITT	1N4002
CR4	100V, PIV, Min.	1281-0023	ITT	1N4002
CR5	100V, PIV, Min.	1281-0023	ITT	1N4002
CR6	Zener, 6.2V, 1N827	1281-0038	Transitron	1N827
CR7	100V, PIV, Min.	1281-0023	ITT	1N4002
CR8	100V, PIV, Min.	1281-0023	ITT	1N4002
CR9	100V, PIV, Min.	1281-0023	ITT	1N4002
CR10	100V, PIV, Min.	1281-0023	ITT	1N4002
CR11	100V, PIV, Min.	1281-0023	ITT	1N4002
CR12	100V, PIV, Min.	1281-0023	ITT	1N4002
CR13	100V, PIV, Min.	1281-0023	ITT	1N4002
CR14	100V, PIV, Min.	1281-0023	ITT	1N4002
CR15	100V, PIV, Min.	1281-0023	ITT	1N4002
CR16	100V, PIV, Min	1281-0023	ITT	1N4002
CR17	Zener, 6.2V, 1N827	1281-0038	Transitron	1N827
	FUSES			
F1	Slo-Blo, 2 amp.	1955-0001	Littlefuse	313002
F2	Slo-Blo, 1 amp.	1955-0006	Littlefuse	3AG-313001
F3	Slo-Blo, 2 amp.	1955-0001	Littlefuse	313002
	INTEGRATED CIRCUITS			
IC1	High Performance Op. Amp.	2025-0022	T.I.	SN72741N
IC2	High Performance Op. Amp.	2025-0022	T.I.	SN72741N
IC3	High Performance Op. Amp.	2025-0022	T.I.	SN72741N
IC4	High Performance Op. Amp.	2025-0022	T.I.	SN72741N

LOW VOLTAGE POWER SUPPLY (cont). 2700

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	RESISTORS			
R1	WW, 1Ω, ±5%, 3W	1159-0001	Ohmite	4330
R2	Comp, 10k, ±5%, 1/4W	1066-1035	Allen Bradley	CB1035
R3	Comp, 1k, ±5%, 1/4W	1066-1025	Allen Bradley	CB1025
R4	Comp, 1k, ±5%, 1/4W	1066-1025	Allen Bradley	CB1025
R5	WW, 1Ω, ±5%, 3W	1159-0001	Ohmite	4330
R6	Comp, 1.8k, ±5%, 1/4W	1066-1825	Allen Bradley	CB1825
R7	Metal Film, 10k, ±1%, 1/10W	1074-1029	Dale	MF-1/10-T9
R8	Pot, 1k, ±10%, 3/4W	1215-0013	Helitrim	89WR
R9	Metal Film, 4.02k, ±1%, 1/10W	1074-1026	Dale	MF-1/10-T9
R10	Metal Film, 12.1k, ±1%, 1/10W	1074-1030	Dale	MF-1/10-T9
R11	Pot, 1k, ±10%, 314W	1215-0013	Helitrim	89WR
R12	Metal Film, 4.99k, ±1%, 1/10W	1074-1027	Dale	MF-1/10-T9
R13	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen Bradley	CB1015
R14	Comp, 10k, ±5%, 1/4W	1066-1035	Allen Bradley	CB1035
R15	Comp, 10k, ±5%, 1/4W	1066-1035	Allen Bradley	CB1035
R16	Comp, 430Ω, ±5%, 1/4W	1066-4315	Allen Bradley	CB4315
R17	Comp, 6.8k, ±5%, 1/4W	1066-6825	Allen Bradley	CB6825
R18	WW, 1Ω, ±5%, 3W	1159-0001	Ohmite	4330
R19	Comp, 10k, ±5%, 1/4W	1066-1035	Allen Bradley	CB1035
R20	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen Bradley	CB1015
R21	Comp. 1k, ±5%, 1/4W	1066-1025	Allen Bradley	CB1025
R22	WW, 1Ω, ±5%, 3W	1159-0001	Ohmite	4330
R23	Metal Film, 1.43k, ±1%, 1/10W	1074-1024	Dale	MF-1/10-T9
R24	Pot. 500Ω, ±10%, 3/4W	1215-0011	Helitrim	89WR
R25	Metal Film, 2.43k, ±1%, 1/10W	1074-1025	Dale	MF-1/10-T9
R26	Metal Film, 10k, ±1%, 1/10W	1074-1029	Dale	MF-1/10-T9
R27	Metal Film, 10k, ±1%, 1/10W	1074-1029	Dale	MF-1/10-T9
R28	WW, 1Ω, ±5%, 3W	1159-0001	Ohmite	4330
R29	Comp, 10k, ±5%, 1/4W	1066-1035	Allen Bradley	CB1035
R30	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen Bradley	CB1015
R31	Comp, 1k, ±5%, 1/4W	1066-1025	Allen Bradley	CB1025
R32	WW, 1Ω, ±5%, 3W	1159-0001	Ohmite	4330
R33	Comp, 820Ω, ±5%, 1/4W	1066-8215	Allen Bradley	CB8215
R34	Metal Film, 4.64k, ±1%, 1/10W	1074-1005	Dale	MF-1/10-T9
R35	Pot, 1k, ±10%, 3/4W	1215-0013	Helitrim	89WR
R36	Metal Film, 4.02k, ±1%, 1/10W	1074-1026	Dale	MF-1/10-T9
	TRANSISTORS			
Q1	Si, NPN, 2N3053	1272-0011	RCA	2N3053
Q2	Si, NPN, 2N3567	1272-0014	Fairchild	2N3567
Q3	Si, NPN, 2N3053	1272-0011	RCA	2N3053
Q4	Si, NPN, 2N3053	1272-0011	RCA	2N3053
Q5	Si, NPN, 2N3567	1272-0014	Fairchild	2N3567
Q6	Si, NPN, 2N3053	1272-0011	RCA	2N3053
Q7	Si, NPN, 2N3567	1272-0014	Fairchild	2N3567



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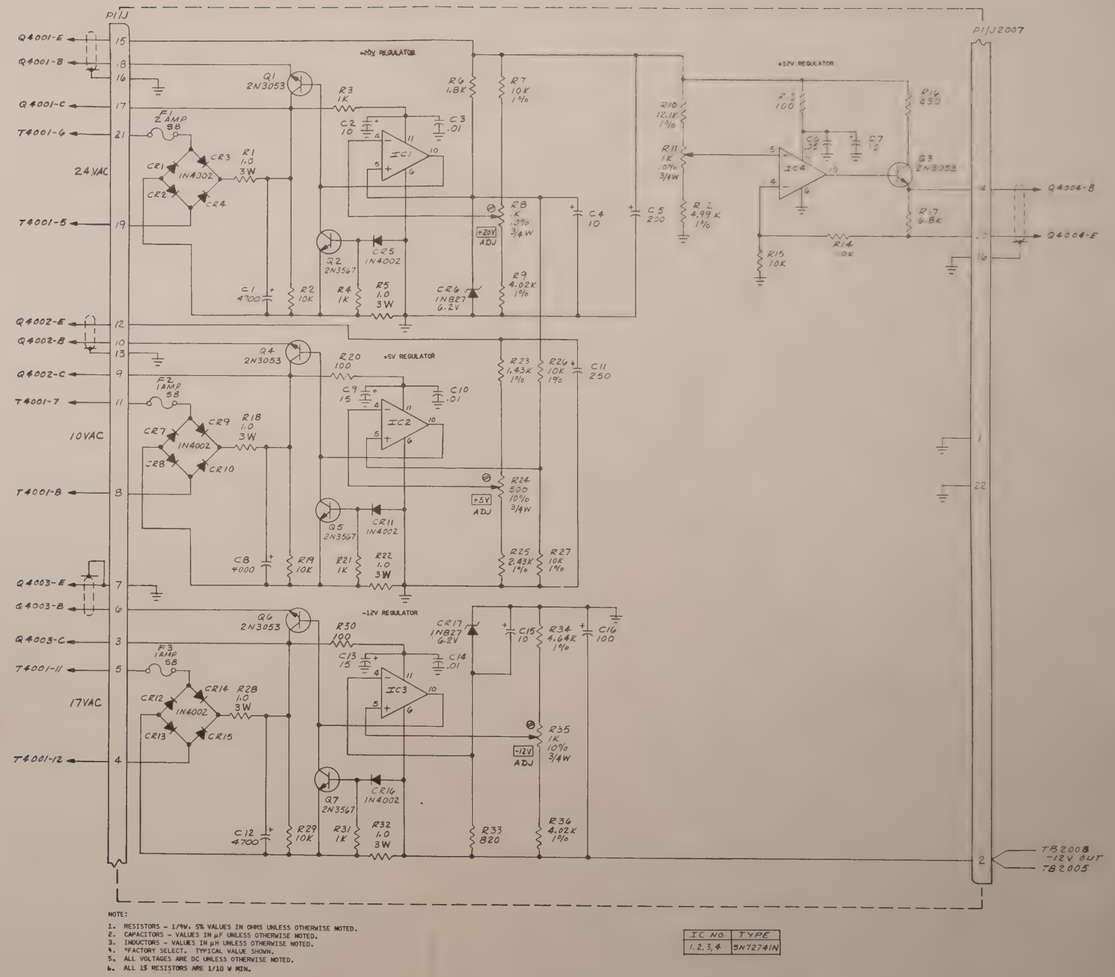


Figure 3-10. Low Voltage Power Supply. 2700

HIGH VOLTAGE CHASSIS. 3000

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	Assy, High-Voltage Chassis	7007-0011	Cushman	
	Chassis, High Voltage	2475-0042	Cushman	
	CONNECTORS			
J1	Single Row, 22-pin	2535-0018	Viking	2VK22S/1-1
J2	Single Row, 22-pin	2535-0018	Viking	2VK22S/1-1
	RESISTORS			
R1	Pot, 5k, ±10%, 2W	1203-0044	CTS	551-BJ05106
R2	Pot, 2MΩ, ±10%, 2W	1203-0050	CTS	551-BJ17874
R3	Pot, 100k, ±10%, 2W	1203-0045	CTS	551-BJ05107
R4	Pot, 500Ω, ±10%, 2W	1203-0043	CTS	551-BJ05105
	SOCKET			
XV1	CRT, 12 pin	2605-0011	Cinch-Jones	3B12
	TRANSISTOR			
Q1	Si, NPN, Power Amp.	1272-0041	RCA	2N3055

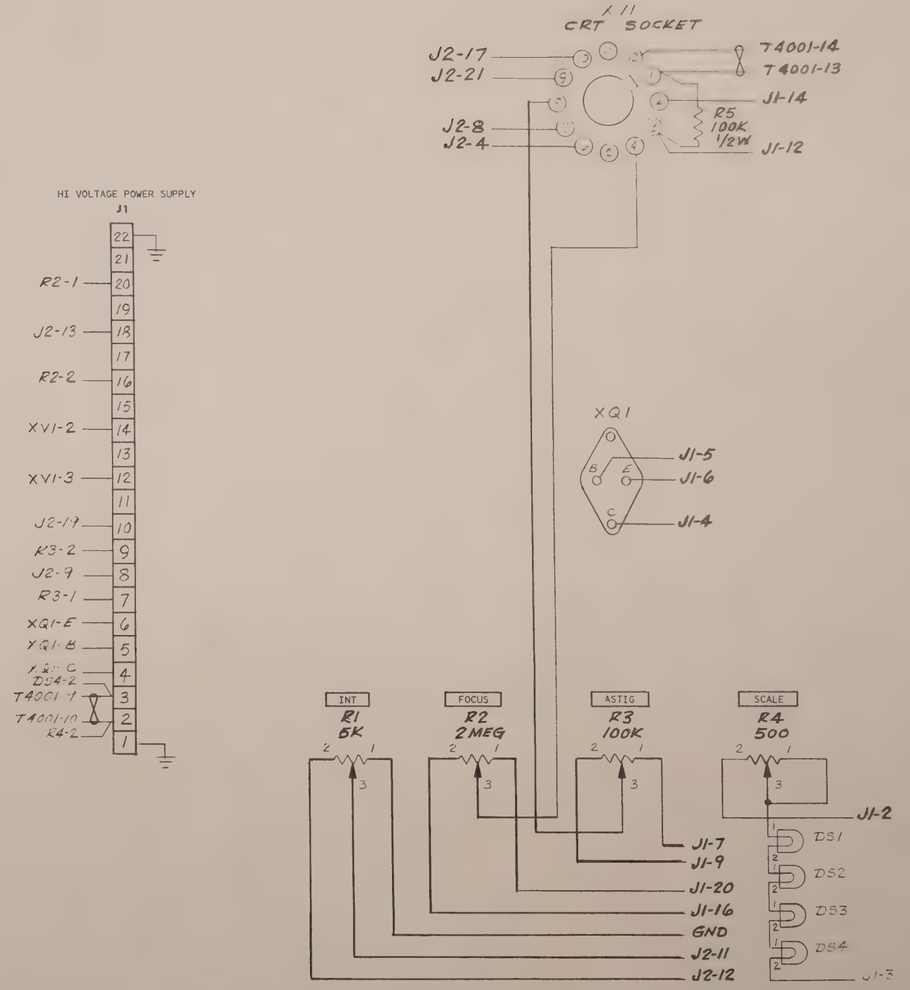


Figure 3-11. High Voltage Chassis, Interconnection Diagram. 3000

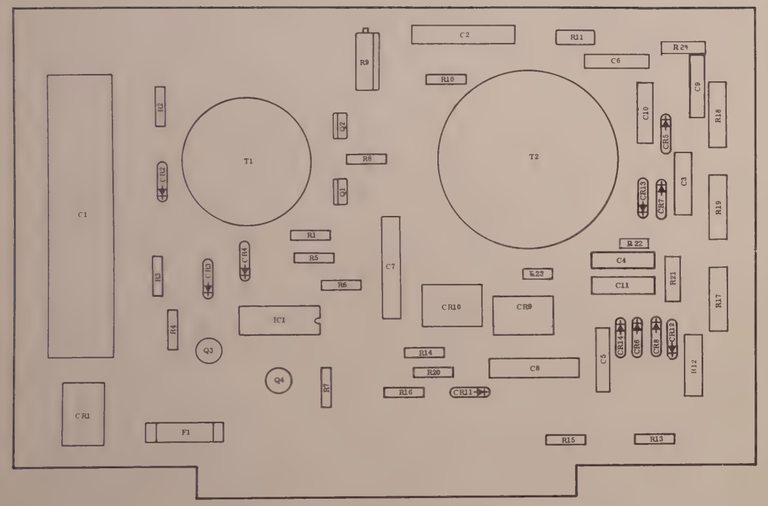
3-59/3-60

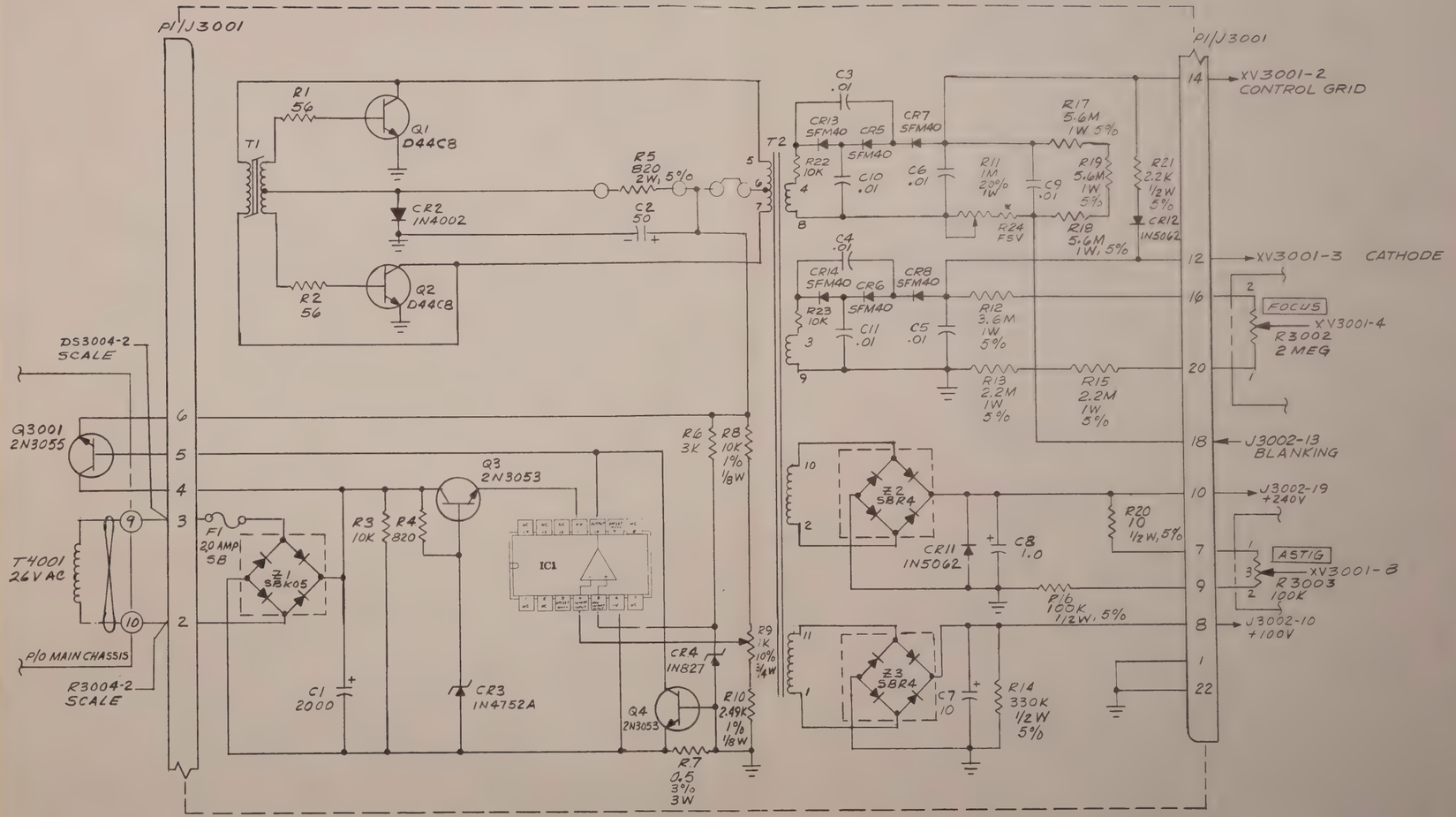
HIGH VOLTAGE POWER SUPPLY. 3100

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	High Voltage Power Supply P.C. Board Assembly	7001-0225	Cushman	
	P.C. Board	1780-0217	Cushman	
	CAPACITORS			
C1	Elect, 2000μF, +150-10%, 50V	1014-0015	Ill. Elna	50T2000
C2	Elect, 50μF, 50V	1013-0007	Sprague	30D506G050DD5
C3	Cer, .01μF, ±20V, 3kV	1005-0069	Sprague	30GA-S/10
C4	Cer, .01μF, ±20%, 3kV	1005-0069	Sprague	30GA-S/10
C5	Cer, .01μF, ±20%, 3kV	1005-0069	Sprague	30GA-S/10
C6	Cer, .01μF, ±20%, 3kV	1005-0069	Sprague	30GA-S/10
C7	Elect, 10μF, +75-10%, 150V	1013-0017	Sprague	30D106G150DD5
C8	Elect, 1μF, +150-10%, 450V	1014-0011	STM	33C450DB10
C9	Cer, .01μF, ±20%, 3kV	1005-0069	Sprague	30GA-S/10
C10	Cer, .01μF, ±20%, 3kV	1005-0069	Sprague	30GA-S/10
C11	Cer, .01μF, ±20%, 3kV	1005-0069	Sprague	30GA-S/10
	DIODES			
CR1	Not Used			
CR2	Si, 100V PIV, MIN.	1281-0023	ITT	1N4002
CR3	Zener, Si, 33V ±5%, 1W	1281-0047	Motorola	1N4752A
CR4	Zener, Si, 6.2V	1281-0038	Transitron	1N827
CR5	Si, 4000 PIV	1281-0049	Semtech	SFM40
CR6	Si, 4000 PIV	1281-0049	Semtech	SFM40
CR7	Si, 4000 PIV	1281-0049	Semtech	SFM40
CR8	Si, 4000 PIV	1281-0049	Semtech	SFM40
CR9	Not Used			
CR10	Not Used			
CR11	Rectifier, Si, 1 amp	1281-0030	G.E.	1N5062
CR12	Rectifier, Si. 1 amp	1281-0030	G.E.	1N5062
CR13	Si, 4000 PIV	1281-0049	Semtech	SFM40
CR14	Si, 4000 PIV	1281-0049	Semtech	SFM40
	DIODE BRIDGES			
Z1	Bridge Rectifier, 1.5 amp, 50 PIV	1281-5001	Semtech	SBR05
Z2	Bridge Rectifier, 1.5 amp, 400 PIV	1281-5002	Semtech	SBRA
Z3	Bridge Rectifier, 1.5 amp, 400 PIV	1281-5002	Semtech	SBRA
	FUSES			
F1	Slo-Blo, 2 amp	1955-0001	Littlefuse	313002
	INTEGRATED CIRCUITS			
IC1	High Performance Op-Amp	2025-0022	T.I.	SN72741N
	RESISTORS			
R1	Comp, 56Ω, ±5%, 1/4W	1066-5605	Allen-Bradley	CB5605
R2	Comp, 56Ω, ±5%, 1/4W	1066-5605	Allen-Bradley	CB5605
R3	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R4	Comp, 820Ω, ±5%, 1/4W	1066-8215	Allen-Bradley	CB8215
R5	Comp, 820Ω, ±5%, 2W	1069-8215	Allen-Bradley	HB8215
R6	Comp, 3k, ±5%, 1/4W	1066-3025	Allen-Bradley	CB3025
R7	WW, .5Ω, ±3%, 3W	1159-0002	Dale	RS-2B
R8	Metal Film, 10k, ±1%, 1/8W	1075-0009	Dale	MFF-1/8-T1
R9	Pot, 1k, ±10%, 3/4W	1215-0013	Helitrim	89WR
R10	Metal Film, 2.49k, ±1%, 1/8W	1075-0027	Dale	MFF-1/8-T1

HIGH VOLTAGE POWER SUPPLY (cont). 3100

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R11	Pot, WW, 1 MΩ, ±20%, 1W	1200-0026	CTS	360S105B
R12	Comp, 3.6 MΩ, ±5%, 1W	1068-3655	Allen-Bradley	GB3655
R13	Comp, 2.2 MΩ, ±5%, 1W	1068-2255	Allen-Bradley	GB2255
R14	Comp, 330k, ±5%, 1/2W	1067-3345	Allen-Bradley	EB3345
R15	Comp, 2.2 MΩ, ±5%, 1W	1068-2255	Allen-Bradley	GB2255
R16	Comp, 100k, ±5%, 1/2W	1067-1045	Allen-Bradley	EB1045
R17	Comp, 5.6 MΩ, ±5%, 1W	1068-5655	Allen-Bradley	GB5655
R18	Comp, 5.6 MΩ, ±5%, 1W	1068-5655	Allen-Bradley	GB5655
R19	Comp, 5.6 MΩ, ±5%, 1W	1068-5655	Allen-Bradley	GB5655
R20	Comp, 10Ω, ±5%, 1/2W	1067-1005	Allen-Bradley	EB1005
R21	Comp, 2.2k, ±5%, 1/2W	1067-2225	Allen-Bradley	EB2225
R22	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R23	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R24	Comp, FSV, ±5%, 1/2W	1067-XXXX		
	TRANSFORMERS			
T1	Saturable Core	1575-0017	Cushman	
T2	High Voltage	1575-0016	Cushman	
	TRANSISTORS			
Q1	Si, NPN, Power	1272-0056	G.E.	D44C8
Q2	Si, NPN, Power	1272-0056	G.E.	D44C8
Q3	Si, NPN, Power	1272-0011	RCA	2N3053
Q4	Si, NPN, Power	1272-0011	RCA	2N3053





NOTE:

1. RESISTORS - 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS - VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS - VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

IC	TYPE
1	SN74741N

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Figure 3-12. High Voltage Power Supply. 3100

DEFLECTION AMPLIFIER. 3200

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	Deflection Amplifier P. C. Board Assy.	7001-0197	Cushman	
	P.C. Board	1780-0413	Cushman	
	CAPACITORS			
C1	Elect, 1μF, +50-10%, 450V	1014-0011	STM	33C450DB10
C2	Elect, 1μF, +50-10%, 450V	1014-0011	STM	33C450DB10
C3	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C4	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C5	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C6	Elect, 1μF, +150-10%, 450V	1014-0011	STM	33C450DB10
C7	Elect, 1μF, +150-10%, 450V	1014-0011	SRM	33C450DB10
C8	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C9	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C10	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C11	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C12	Poly, .1μF, ±10%, 100V	1008-0031	Sprague	225P10491
C13	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C14	Elect, 1μF, +150-10%, 450V	1014-0011	STM	33C450DB10
C15	Poly, .047μF, ±10%, 100V	1008-0049	Sprague	225P47391
C16	Poly, .1μF, ±10%, 100V	1008-0031	Sprague	225P10491
	COILS			
L1	RF Choke, 2 1/2 turns, Wide Band	1586-0003	Ferroxcube	VK20020/4B
L2	RF Choke, 2 1/2 turns, Wide Band	1586-0003	Ferroxcube	VK20020/4B
L3	RF Choke, 2 1/2 turns, Wide Band	1585-0003	Ferroxcube	VK20020/4B
L4	RF Choke, 2 1/2 turns, Wide Bank	1585-0003	Ferroxcube	VK20020/4B
	DIODES			
CR1	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR2	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR3	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR4	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR5	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR6	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR7	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR8	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR9	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR10	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
	INTEGRATED CIRCUITS			
IC1	High Performance Op. Amp.	2025-0022	T.I.	SN72741N
IC2	High Performance Op. Amp.	2025-0022	T.I.	SN72741N
	RESISTORS			
R1	Metal Film, 100k, ±1%, 1/2W	1076-0009	Dale	MFF-1/2-T1
R2	Metal Film, 100k, ±1%, 1/2W	1076-0009	Dale	MFF-1/2-T1
R3	Metal Film, 221k, ±1%, 1/2W	1076-0016	Dale	MFF-1/2-T1
R4	Metal Film, 196k, ±1%, 1/2W	1076-0015	Dale	MFF-1/2-T1
R5	Comp, 470k, ±5%, 1/4W	1066-4745	Allen-Bradley	CB4745
R6	Pot, 10k, ±10%, 3/4W	1215-0014	Helitrim	89WR
R7	Metal Film, 332Ω, ±1%, 1/8W	1075-0024	Dale	MFF-1/8-T1
R8	Metal Film, 11.3k, ±1%, 1/8W	1075-0034	Dale	MFF-1/8-T1
R9	Metal Film, 5.62k, ±1%, 1/2W	1076-0014	Dale	MFF-1/2-T1
R10	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225

DEFLECTION AMPLIFIER (cont). 3200

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R11	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R12	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R13	Metal Film, 332Ω, ±1%, 1/8W	1075-0024	Dale	MFF-1/8-T1
R14	Metal Film, 11.3k, ±1%, 1/8W	1075-0034	Dale	MFF-1/8-T1
R15	Pot, 10k, ±10%, 3/4W	1215-0014	Helitrim	89WR
R16	Comp, 3.3k, ±5%, 1/4W	1066-3325	Allen-Bradley	CB3325
R17	Comp, 1 MΩ, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R18	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R19	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R20	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
R21	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R22	Pot, 1k, ±10%, 3/4W	1215-0013	Heletrim	89WR
R23	Comp, FSV, ±5%, 1/4W	1066-XXXX		
R24	Pot, 1k, ±10%, 3/4W	1215-0013	Helitrim	89WR
R25	Pot, 10k, ±10%, 3/4W	1215-0014	Helitrim	89WR
R26	Metal Film, 221k, ±1%, 1/2W	1076-0016	Dale	MFF-1/2-T1
R27	Metal Film, 11.3k, ±1%, 1/8W	1075-0034	Dale	MFF-1/8-T1
R28	Metal Film, 332Ω, ±1%, 1/8W	1075-0024	Dale	MFF-1/8-T1
R29	Metal Film, 100k, ±1%, 1/2W	1076-0009	Dale	MFF-1/2-T1
R30	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225
R31	Metal Film, 5.62k, ±1%, 1/2W	1076-0014	Dale	MFF-1/2-T1
R32	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB8225
R33	Comp. 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R34	Metal Film, 100k, ±1%, 1/2W	1076-0009	Dale	MFF-1/2-T1
R35	Metal Film, 196k, ±1%, 1/2W	1076-0015	Dale	MFF-1/2-T1
R36	Metal Film, 332Ω, ±1%, 1/8W	1075-0024	Dale	MFF-1/8-T1
R37	Metal Film, 11.3k, ±1%, 1/8W	1075-0034	Dale	MFF-1/8-T1
R38	Pot, 10k, ±10%, 3/4W	1215-0014	Helitrim	89WR
R39	Comp, 4.3k, ±5%, 1/4W	1066-4325	Allen-Bradley	CB4325
R40	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R41	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R42	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R43	Comp, 91k, ±5%, 1/4W	1066-9135	Allen-Bradley	CB9135
R44	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R45	Comp, 3.6k, ±5%, 1/4W	1066-3625	Allen-Bradley	CB3625
R46	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R47	Comp, 270Ω, ±5%, 1/4W	1066-2715	Allen-Bradley	CB2715
R48	Comp, 5.1k, ±5%, 1/4W	1066-5125	Allen-Bradley	CB5125
R49	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R50	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R51	Comp, 5.6k, ±5%, 1/4W	1066-5625	Allen-Bradley	CB5625
	TRANSISTORS			
Q1	Si, NPN, MJE340	1272-0046	Motorola	MJE340
Q2	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q3	Si, NPN, MJE340	1272-0046	Motorola	MJE340
Q4	Si, NPN, MJE340	1272-0046	Motorola	MJE340
Q5	Si, NPN, MJE340	1272-0046	Motorola	MJE340
Q6	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q7	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q8	Si, NPN, MJE340	1272-0046	Motorola	MJE340
Q9	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q10	Si, NPN, MJE340	1272-0046	Motorola	MJE340

DEFLECTION AMPLIFIER. 3200

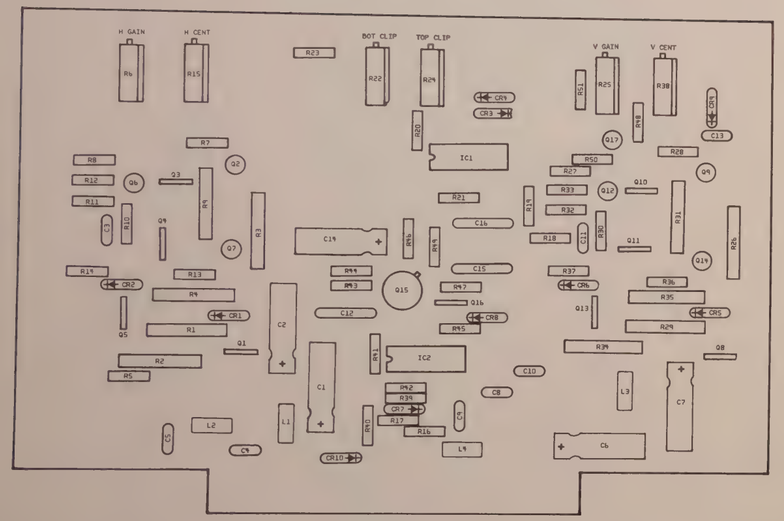
CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	Deflection Amplifier P. C. Board Assy.	7001-0197	Cushman	
	P.C. Board	1780-0413	Cushman	
	CAPACITORS			
C1	Elect, 1μF, +50-10%, 450V	1014-0011	STM	33C450DB10
C2	Elect, 1μF, +50-10%, 450V	1014-0011	STM	33C450DB10
C3	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C4	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C5	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C6	Elect, 1μF, +150-10%, 450V	1014-0011	STM	33C450DB10
C7	Elect, 1μF, +150-10%, 450V	1014-0011	SRM	33C450DB10
C8	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C9	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C10	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C11	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C12	Poly, .1μF, ±10%, 100V	1008-0031	Sprague	225P10491
C13	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C14	Elect, 1μF, +150-10%, 450V	1014-0011	STM	33C450DB10
C15	Poly, .047μF, ±10%, 100V	1008-0049	Sprague	225P47391
C16	Poly, .1μF, ±10%, 100V	1008-0031	Sprague	225P10491
	COILS			
L1	RF Choke, 2 1/2 turns, Wide Band	1586-0003	Ferroxcube	VK20020/4B
L2	RF Choke, 2 1/2 turns, Wide Band	1586-0003	Ferroxcube	VK20020/4B
L3	RF Choke, 2 1/2 turns, Wide Band	1585-0003	Ferroxcube	VK20020/4B
L4	RF Choke, 2 1/2 turns, Wide Bank	1585-0003	Ferroxcube	VK20020/4B
	DIODES			
CR1	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR2	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR3	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR4	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR5	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR6	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR7	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR8	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR9	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
CR10	DO-7 pkg, 1N3064	1281-0013	Teledyne	1N3064
	INTEGRATED CIRCUITS			
IC1	High Performance Op. Amp.	2025-0022	T.I.	SN72741N
IC2	High Performance Op. Amp.	2025-0022	T.I.	SN72741N
	RESISTORS			
R1	Metal Film, 100k, ±1%, 1/2W	1076-0009	Dale	MFF-1/2-T1
R2	Metal Film, 100k, ±1%, 1/2W	1076-0009	Dale	MFF-1/2-T1
R3	Metal Film, 221k, ±1%, 1/2W	1076-0016	Dale	MFF-1/2-T1
R4	Metal Film, 196k, ±1%, 1/2W	1076-0015	Dale	MFF-1/2-T1
R5	Comp, 470k, ±5%, 1/4W	1066-4745	Allen-Bradley	CB4745
R6	Pot, 10k, ±10%, 3/4W	1215-0014	Helitrim	89WR
R7	Metal Film, 332Ω, ±1%, 1/8W	1075-0024	Dale	MFF-1/8-T1
R8	Metal Film, 11.3k, ±1%, 1/8W	1075-0034	Dale	MFF-1/8-T1
R9	Metal Film, 5.62k, ±1%, 1/2W	1076-0014	Dale	MFF-1/2-T1
R10	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225

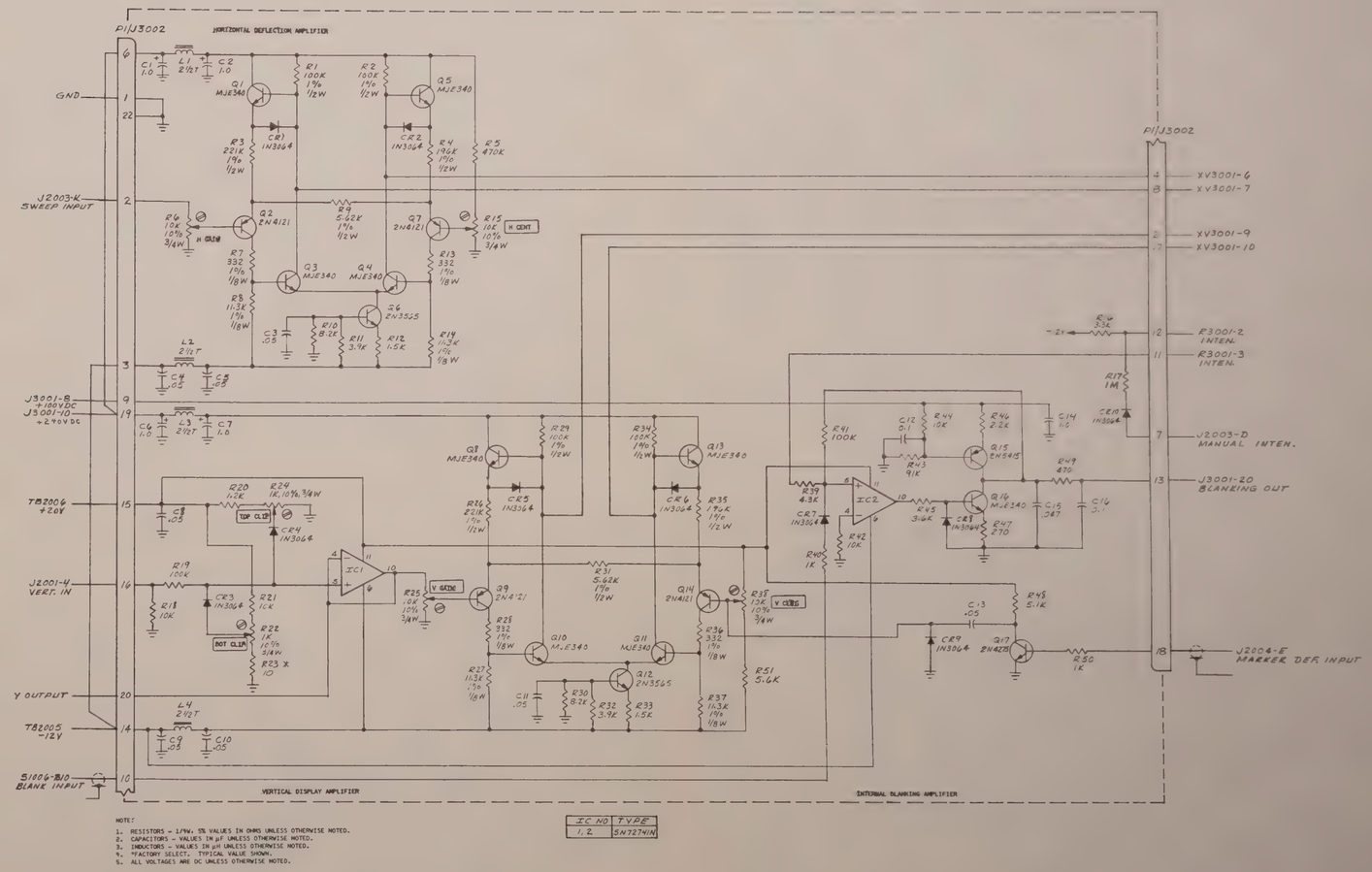
DEFLECTION AMPLIFIER (cont). 3200

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
R11	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R12	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R13	Metal Film, 332Ω, ±1%, 1/8W	1075-0024	Dale	MFF-1/8-T1
R14	Metal Film, 11.3k, ±1%, 1/8W	1075-0034	Dale	MFF-1/8-T1
R15	Pot, 10k, ±10%, 3/4W	1215-0014	Helitrim	89WR
R16	Comp, 3.3k, ±5%, 1/4W	1066-3325	Allen-Bradley	CB3325
R17	Comp, 1 MΩ, ±5%, 1/4W	1066-1055	Allen-Bradley	CB1055
R18	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R19	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R20	Comp, 1.2k, ±5%, 1/4W	1066-1225	Allen-Bradley	CB1225
R21	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R22	Pot, 1k, ±10%, 3/4W	1215-0013	Heletrim	89WR
R23	Comp, FSV, ±5%, 1/4W	1066-XXXX		
R24	Pot, 1k, ±10%, 3/4W	1215-0013	Helitrim	89WR
R25	Pot, 10k, ±10%, 3/4W	1215-0014	Helitrim	89WR
R26	Metal Film, 221k, ±1%, 1/2W	1076-0016	Dale	MFF-1/2-T1
R27	Metal Film, 11.3k, ±1%, 1/8W	1075-0034	Dale	MFF-1/8-T1
R28	Metal Film, 332Ω, ±1%, 1/8W	1075-0024	Dale	MFF-1/8-T1
R29	Metal Film, 100k, ±1%, 1/2W	1076-0009	Dale	MFF-1/2-T1
R30	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225
R31	Metal Film, 5.62k, ±1%, 1/2W	1076-0014	Dale	MFF-1/2-T1
R32	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB8225
R33	Comp. l.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R34	Metal Film, 100k, ±1%, 1/2W	1076-0009	Dale	MFF-1/2-T1
R35	Metal Film, 196k, ±1%, 1/2W	1076-0015	Dale	MFF-1/2-T1
R36	Metal Film, 332Ω, ±1%, 1/8W	1075-0024	Dale	MFF-1/8-T1
R37	Metal Film, 11.3k, ±1%, 1/8W	1075-0034	Dale	MFF-1/8-T1
R38	Pot, 10k, ±10%, 3/4W	1215-0014	Helitrim	89WR
R39	Comp, 4.3k, ±5%, 1/4W	1066-4325	Allen-Bradley	CB4325
R40	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R41	Comp, 100k, ±5%, 1/4W	1066-1045	Allen-Bradley	CB1045
R42	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R43	Comp, 91k, ±5%, 1/4W	1066-9135	Allen-Bradley	CB9135
R44	Comp, 10k, ±5%, 1/4W	1066-1035	Allen-Bradley	CB1035
R45	Comp, 3.6k, ±5%, 1/4W	1066-3625	Allen-Bradley	CB3625
R46	Comp, 2.2k, ±5%, 1/4W	1066-2225	Allen-Bradley	CB2225
R47	Comp, 270Ω, ±5%, 1/4W	1066-2715	Allen-Bradley	CB2715
R48	Comp, 5.1k, ±5%, 1/4W	1066-5125	Allen-Bradley	CB5125
R49	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R50	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R51	Comp, 5.6k, ±5%, 1/4W	1066-5625	Allen-Bradley	CB5625
	TRANSISTORS			
Q1	Si, NPN, MJE340	1272-0046	Motorola	MJE340
Q2	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q3	Si, NPN, MJE340	1272-0046	Motorola	MJE340
Q4	Si, NPN, MJE340	1272-0046	Motorola	MJE340
Q5	Si, NPN, MJE340	1272-0046	Motorola	MJE340
Q6	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q7	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q8	Si, NPN, MJE340	1272-0046	Motorola	MJE340
Q9	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q10	Si, NPN, MJE340	1272-0046	Motorola	MJE340

DEFLECTION AMPLIFIER (cont). 3200

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
Q11	Si, NPN, MJE340	1272-0046	Motorola	MJE340
Q12	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q13	Si, NPN, MJE340	1272-0046	Motorola	MJE340
Q14	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q15	Si, PNP, 2N5415	1272-0051	RCA	2N5415
Q16	Si, NPN, MJE340	1272-0046	Motorola	MJE340
Q17	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275





NOTE:
1. RESISTORS = 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS = VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS = VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

IC NO	TYPE
1, 2	SN7274N

5601**0047

Figure 3-13. Deflection Amplifier. 3200

REAR PANEL. 4000

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	Assy. Rear Panel	7003-0070	Cushman	
	Rear Panel	2800-0085	Cushman	
	DIODE			
CR1	PIV. MIN, 100V	1281-0023	ITT	1N4002
	FILTER			
FL1	Filter, RFI Line, 5 amp.	1040-0028	Corcom	5B1
	FUSE			
F1	Slo-blo, 1 amp	1955-0006	Littlefuse	3AG-313001
	HOLDER			
	Fuse, 3AG, Bayonet knob	1965-0001	Littlefuse	342012AL
	CONNECTORS			
J1	Not Used			
J2	BNC, 50Ω, Receptacle	2536-0034	Kings	KC79-143
J3	BNC, 50Ω, Receptacle	2536-0034	Kings	KC79-143
J4	BNC, 50Ω, Receptacle	2536-0034	Kings	KC79-143
J5	BNC, 50Ω, Receptacle	2536-0034	Kings	KC79-143
J6	BNC, 50Ω, Receptacle	2536-0034	Kings	KC79-143
J7	BNC, 50Ω, Receptacle	2536-0034	Kings	KC79-143
J8	BNC, 50Ω, Receptacle	2536-0034	Kings	KC79-143
J9	Post, Binding, red	2595-0003	Superior	DF21RC
J10	Post, Binding, red	2595-0003	Superior	DF21RC
	RELAY			
K1	DPDT, 20V	1313-0008	Clare	FC1109F00
	SOCKET			
	Power Transistor	2603-0003	Augat	8080-1G1
	Power Transistor	2603-0003	Augat	8080-1G1
	Power Transistor	2603-0003	Augat	8080-1G1
	SWITCH			
S1	Slide, 115/230V	1850-0012	Switchcraft	4625LFR
	TRANSFORMER			
T1	Power	1575-0021	Cushman	
	TRANSISTORS			
Q1	Si, NPN, Power Amp.	1272-0041	RCA	2N3055
Q2	Si, NPN, Power Amp.	1272-0041	RCA	2N3055
Q3	Si, NPN, Power Amp.	1272-0041	RCA	2N3055
Q4	Si, NPN, Power Amp.	1272-0041	RCA	2N3055

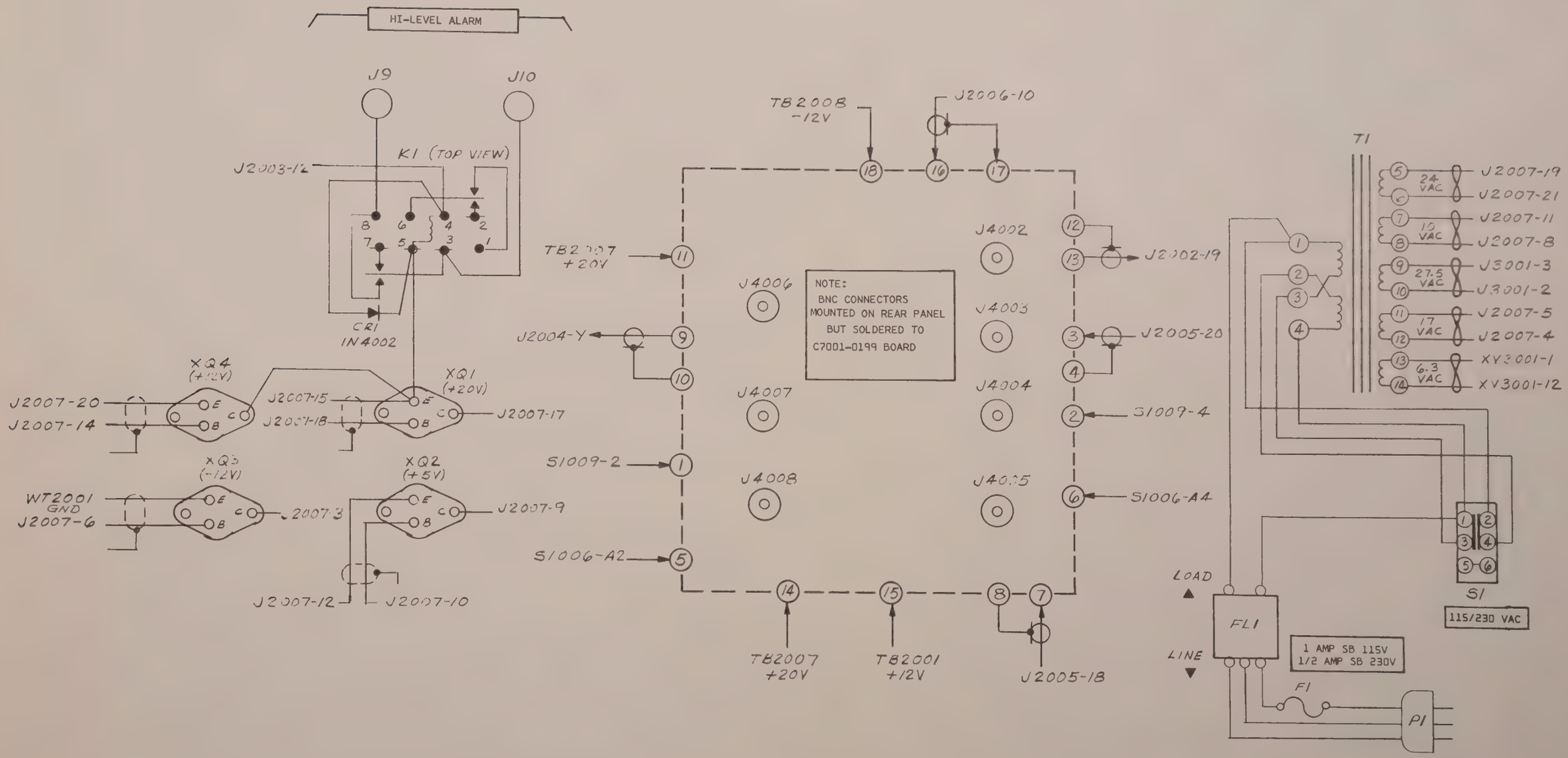


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Figure 3-14. Rear Panel, Interconnection Diagram. 4000

3-73/3-74

RF SWITCH AND BUFFER. 4100

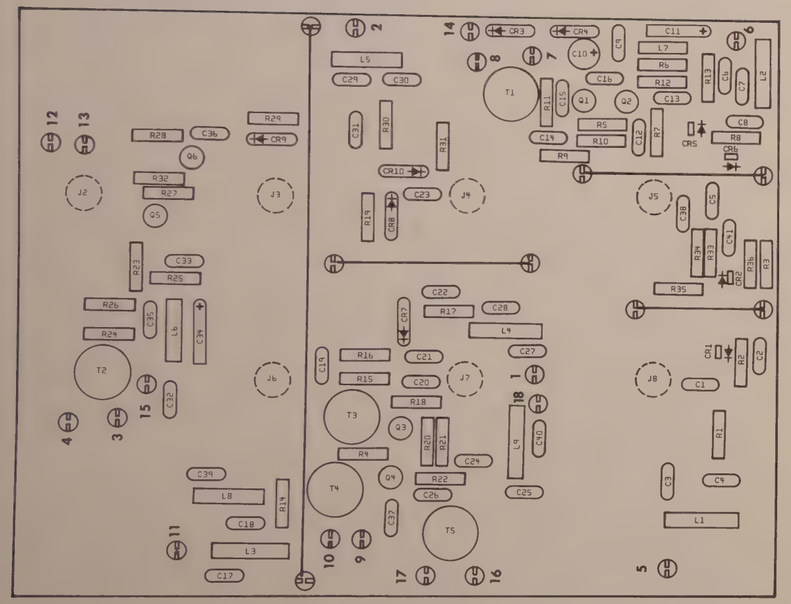
CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	R. F. Switch P. C. Board Assy.	7001-0199	Cushman	
	P. C. Board	1780-0411	Cushman	
	CAPACITORS			
C1	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C2	Mica, 30pF, ±5%, 500V	1002-0043	Elmenco	DM15-E-300J
C3	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C4	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C5	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C6	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C7	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C8	Mica, 30pF, ±5%, 500V	1002-0043	Elmenco	DM15-E-300J
C9	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C10	Tant, 100μF, ±20%, 20V	1011-0010	Kemet	T362D107M020A
C11	Tant, 10μF, ±10%, 20V	1011-0007	Kemet	K10C20K
C12	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C13	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C14	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C15	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C16	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C17	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C18	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C19	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C20	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C21	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C22	Mica, 30pF, ±5%, 500V	1002-0043	Elmenco	DM15-E-300J
C23	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C24	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C25	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C26	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C27	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C28	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C29	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C30	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C31	Mica, 30pF, ±5%, 500V	1002-0043	Elmenco	DM15-E-300J
C32	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C33	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C34	Tant, 10μF, ±10%, 20V	1011-0007	Kemet	K10C20K
C35	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C36	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C37	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C38	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C39	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C40	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
C41	Cer, .05μF, +80-20%, 25V	1005-0014	Erie	5855-505-Y5U0-503Z
	COILS			
L1	RF Choke, 22μH, ±10%	1585-0012	Delevan	1537-44
L2	RF Choke, 22μH, ±10%	1585-0012	Delevan	1537-44
L3	RF Choke, 22μH, ±10%	1585-0012	Delevan	1537-44
L4	RF Choke, 22μH, ±10%	1585-0012	Delevan	1537-44
L5	RF Choke, 22μH, ±10%	1585-0012	Delevan	1537-44
L6	RF Choke, 22μH, ±10%	1585-0012	Delevan	1537-44
L7	RF Choke, 15μH, ±10%	1585-0051	Delevan	1025-48
L8	RF Choke, 22μH, ±10%	1585-0012	Delevan	1537-44
L9	RF Choke, 22μH, ±10%	1585-0012	Delevan	1537-44

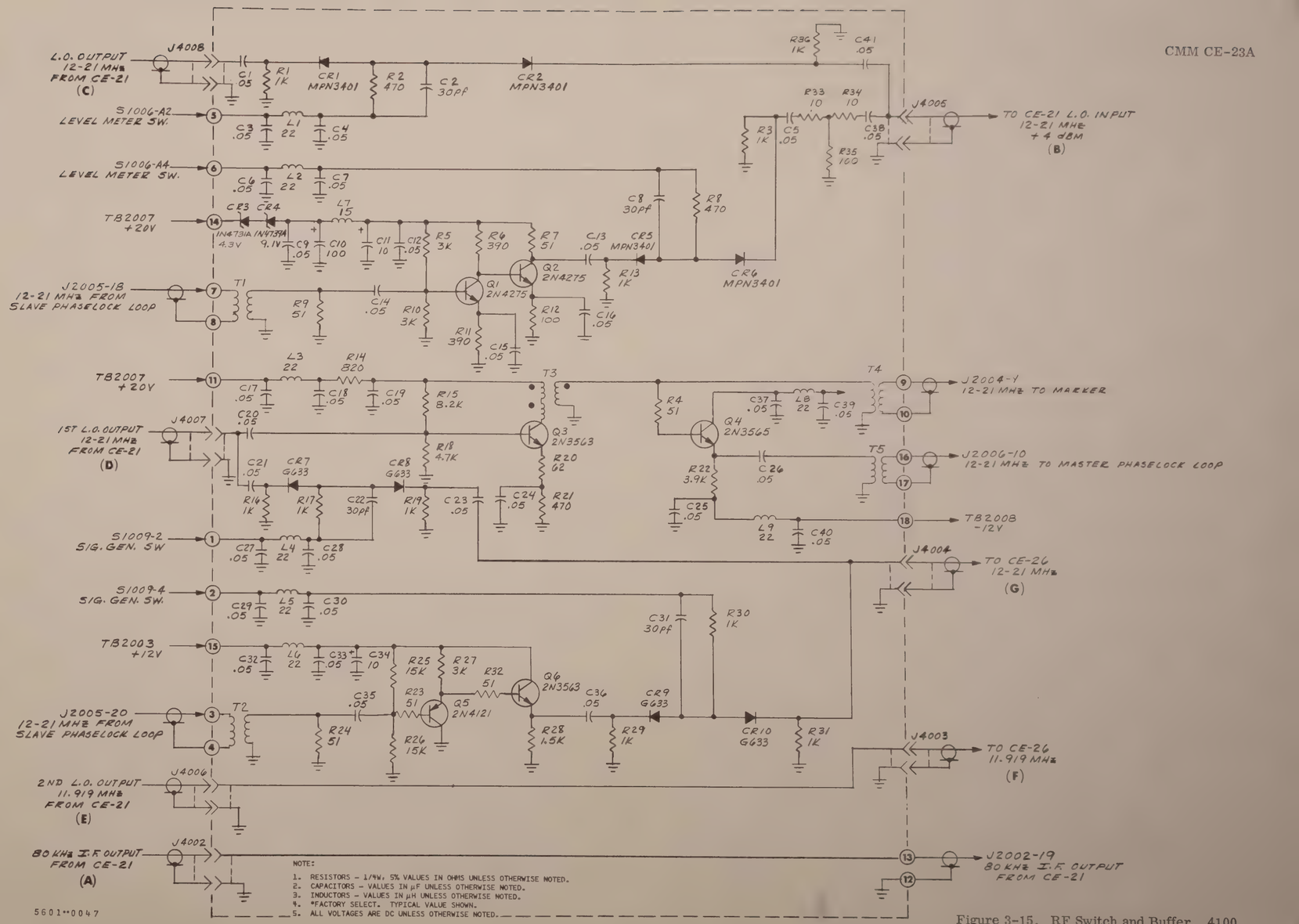
RF SWITCH AND BUFFER (cont). 4100

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	DIODES			
CR1	Silicon pin switching	1281-0050	Motorola	MPN-3401
CR2	Silicon pin switching	1281-0050	Motorola	MPN-3401
CR3	Zener, 4.3V, 1N4731A	1281-0025	I.R.	1N4731A
CR4	Si, Zener, 9.1V, ±5%, 1W	1281-0027	I.R.C.	1N4739A
CR5	Silicon pin switching	1281-0050	Motorola	MPN-3401
CR6	Silicon pin switching	1281-0050	Motorola	MPN-3401
CR7	Ger, Signal	1282-0005	I.T.T	G633
CR8	Ger, Signal	1282-0005	I.T.T.	G633
CR9	Ger, Signal	1282-0005	I.T.T.	G633
CR10	Ger, Signal	1282-0005	I.T.T.	G633
	RESISTORS			
R1	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R2	Comp, 470Ω, 5%, 1/4W	1066-4715	Allen-Bradley	CB4714
R3	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R4	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R5	Comp, 3k, ±5%, 1/4W	1066-3025	Allen-Bradley	CB3025
R6	Comp, 390Ω, ±5%, 1/4W	1066-3915	Allen-Bradley	CB3915
R7	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R8	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R9	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R10	Comp, 3k, ±5%, 1/4W	1066-3025	Allen-Bradley	CB3025
R11	Comp, 390Ω, ±5%, 1/4W	1066-3915	Allen-Bradley	CB3915
R12	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R13	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R14	Comp, 820Ω, ±5%, 1/4W	1066-8215	Allen-Bradley	CB8215
R15	Comp, 8.2k, ±5%, 1/4W	1066-8225	Allen-Bradley	CB8225
R16	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R17	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R18	Comp, 4.7k, ±5%, 1/4W	1066-4725	Allen-Bradley	CB4725
R19	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R20	Comp, 62Ω, ±5%, 1/4W	1066-6205	Allen-Bradley	CB6205
R21	Comp, 470Ω, ±5%, 1/4W	1066-4715	Allen-Bradley	CB4715
R22	Comp, 3.9k, ±5%, 1/4W	1066-3925	Allen-Bradley	CB3925
R23	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R24	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R25	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R26	Comp, 15k, ±5%, 1/4W	1066-1535	Allen-Bradley	CB1535
R27	Comp, 3k, ±5%, 1/4W	1066-3025	Allen-Bradley	CB3025
R28	Comp, 1.5k, ±5%, 1/4W	1066-1525	Allen-Bradley	CB1525
R29	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R30	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R31	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
R32	Comp, 51Ω, ±5%, 1/4W	1066-5105	Allen-Bradley	CB5105
R33	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R34	Comp, 10Ω, ±5%, 1/4W	1066-1005	Allen-Bradley	CB1005
R35	Comp, 100Ω, ±5%, 1/4W	1066-1015	Allen-Bradley	CB1015
R36	Comp, 1k, ±5%, 1/4W	1066-1025	Allen-Bradley	CB1025
	TRANSFORMERS			
T1	Toroid Trifilar	1579-0017	Cushman	
T2	Toroid Trifilar	1579-0017	Cushman	
T3	Toroid Trifilar	1579-0017	Cushman	
T4	Toroid Trifilar	1579-0017	Cushman	
T5	Toroid Trifilar	1579-0017	Cushman	

RF SWITCH AND BUFFER (cont). 4100

CKT. REF.	DESCRIPTION	CE STOCK NO.	MFR.	MFR. NO.
	TRANSISTORS			
Q1	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q2	Si, NPN, 2N4275	1272-0016	Fairchild	2N4275
Q3	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563
Q4	Si, NPN, 2N3565	1272-0017	Fairchild	2N3565
Q5	Si, PNP, 2N4121	1272-0023	Fairchild	2N4121
Q6	Si, NPN, 2N3563	1272-0022	Fairchild	2N3563





NOTE:

1. RESISTORS – 1/4W, 5% VALUES IN OHMS UNLESS OTHERWISE NOTED.
2. CAPACITORS – VALUES IN μF UNLESS OTHERWISE NOTED.
3. INDUCTORS – VALUES IN μH UNLESS OTHERWISE NOTED.
4. *FACTORY SELECT. TYPICAL VALUE SHOWN.
5. ALL VOLTAGES ARE DC UNLESS OTHERWISE NOTED.

5601**0047

Figure 3-15. RF Switch and Buffer. 4100

DEAR CUSTOMER:

Every effort has been made to ensure the accuracy of this manual. If an error is discovered please notify us on the postpaid cards attached.

Please indicate where the error has been made. To improve future manuals your comments are requested.

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